

Purification Of Tighra Reservoir Of Gwalior, Madhya Pradesh, India By Tea Waste Adsorbent

Hanit Kumar Thapak¹, Mohammad Muzzammil², Pradeep Lakher³,
Kuldeep Chaudhry⁴ & Shrashti Jain⁵

¹Assistant Prof. Department of Chemical Engineering, Jiwaji University, Gwalior (M.P), India

^{2,3,4&5}Department of Chemical Engineering, Jiwaji University, Gwalior (M.P), India.

Abstract : *In the present case study, Cr,Pb,Cr,Ni,Cd were found in tighra reservoir at time Idols Immersion. These heavy metal contaminated tighra reservoir which is harmful for human health. An effective Tea waste adsorbent were developed which is potential to eradicate heavy metal. Activated carbon showing good result for purification and separation technique but cost is another matter for comparing the adsorbent materials. Characterization of the tea waste adsorbents showed a clear change between physico-chemical properties .The Aim of this work to purified reservoir and safe drinking for public health. The experimental result shows Approx.26.7% removal Cr,Ni,Hg,Cd,Ar and Cu on passing water (Tighra reservoir) with Tea waste adsorbent.*

Tighra Dam is huge water reservoir which is located about 23KM from Gwalior (MP).It supply water to all over the city. This dam is 24m high and 1341m long.It has capacity of 4.8 million cubic meters and it can pass up to 1274cubic m/s.Tighra reservoir lie on 78⁰ 01'30''e – 77⁰56'54''e longitude and 26⁰ 11'08''N latitude and altitude of 218.58 m from sea level.



Fig.1 Tighra Dam Located Near Gwalior

Key words: Tea waste, Heavy metals, Adsorption

1. INTRODUCTION

WATER PROPERTIES:

Table 1.Properties present Tighra Dam water:

TRANSPARENCY	128.71cm	TOTAL DISSOLVE SOLID	114.1mg/l
ELECTRICAL CONDUCTIVITY	138.9μS/cm	FREE CO ₂	0.28mg/l
TOTAL ALKALINITY	28.73mg/l	TOTAL HARDNESS	50.16mg/l
CHLORIDES	26.97mg/l	NITRATE-NITROGEN	0.034mg/l
PHOSPHOROUS	0.008mg/l	MAGNESIUM	3.56mg/l
SODIUM	4.19mg/l	POTASSIUM	2.94mg/l

One of main reason behind contamination of water of Tighra dam is immersion of idols of God during the time of Ganesh Chaturthi and Navgurgas.The Hindu community worship idols of Lord Vishwakarma, Lord Ganesh, and Goddess Durga etc. and submerge these idols in the month of August to October respectively every year. And ritual is performed by Muslims during the

Muharrum festival, and tazias are being immersed by them. The idols are made up of clay, plaster of Paris, cloth, paper wood, thermocol, jute, adhesive material and synthetic paints etc. Out of the all materials which are used to make the idols, thermocol is Non-biodegradable while paints contain heavy metals such as Chromium, Lead, Cadmium and Mercury.The synthetic chemical

paints that are generally used to decorate the idols increases heavy metal concentration and acidity in the water as a result of immersion of these idols in Tighra . Lead and Chromium, which also adds through SINDUR in the water bodies, are very poison even in very small quantity for human being through the process known as Bioaccumulation and Bio magnifications. When idols are submerge, these colors and chemicals containing heavy metals dissolve slowly leading in the water contamination. The floating materials released by idol in the Dam water after decomposition result in eutrophication of the river, lake etc. The idol immersion is a religious activity which is responsible for adding pollution load in the Dam water. In Gwalior, a lot of religious activities take place all around the year. In these festivals number of Ganesh, Durga idols and also tazias in different sizes are immersed in Tighra Dam. About 150 or more Ganesh idols and about 250 Durga idols and tazias are immersed per year which very hazardous to health of animals humans and also for agriculture purposes.



Fig. 2 Tighra Dam contaminated by Idols Immersion.

Health Effect Of Heavy Metals

Heavy metals are any relatively dense metal or metalloid that is noted for its potential toxicity, especially in environmental context. The term has specific uses to cadmium, mercury, lead and arsenic all of which appear in the world health organization. toxic heavy metals which are found naturally but they become coagulated has a result of various human activities such as they get dissolve in water bodies and can enter plant, animal and human tissues through inhalation diet and manual handling then they bind to with the functioning of vital cellular component. In human beings, heavy metal poisoning is mainly treated by the administration of chelating agents. Common sources are from mining and industrial wastes, vehicle emissions, lead acid batteries, fertilisers, paints, treated woods, and aging water supply infrastructure.

Table2. Effects of Heavy Metals:

ELEMENT	ACUTE EXPOSER USUALLY A DAY OR LESS	CHRONIC EXPOSER OFTERN MONTHS OR YEARS
cadmium	Pneumonitis(lung inflammation)	Lung cancer,osteomalacia(softening of bones),proteinuria(excess protein in urine;possible kidney damage)
mercury	Diarrhea, fever, vomiting	Stomatitis(inflammation of gums and mouth),nausea,nephrotic syndrome(non specific kidney disorder),neurasthenia(neurotic disorder),parageusia(metallic taste)pink dieases(pain and pink discolouration of hands and feets),tremor
Lead	Encephalopathy(brain dysfunction nausea vomiting)	Anemia,encephalopathy,foot drop/wrist drop,nephropathy(kidney disease)

Chromium	Gastrointestinal, hemorrhage (bleeding), hemolysis (red blood cell), acute renal failure	Pulmonary fibrosis, lung cancer
arsenic	Nauseas, vomiting, diarrhea, Encephalopathy, multi carbon effect, arrhythmia, painful neuropathy.	Diabetes, hypopigmentation cancer

2. Material and Methods:

2.1. Preparation of the Tea Waste adsorbent

Tea waste collected from **Hotel Rudra Pratap Tomar Purani chhawani Gwalior** (M.P) India and washed with boiled water until the water was colourless. This process is repeated 15 washing cycle and then it is dried in tray dryer at 108⁰c for 12h. This dried material converted into powder and screened to size 100µm. Again this powder dried at 108⁰c for 5 hours and Then dried tea waste was chemically activated with 1.0M sulphuric acid and stored in sealed polythene bags. Now adsorbent is ready to use.

3. Result and discussion

The sample of water was collected from Tighra dam and were tested to UV- Spectrophotometer .the residual concentration of heavy metals were determined by its wavelengths these are given below:-

Heavy Metals	Wavelength(nm)
Nickel (Ni)	392nm
Copper (Cu)	312nm
Zinc (Zn)	310nm
Cyanide (CN)	283.2nm
Cadmium (Cd)	382nm
Lead (Pb)	389.6nm
Chromium (Cr)	540nm
Arsenic (As)	360nm
Mercury (Hg)	396.8nm

0.5g adsorbents were dissolved into 1000ml of Tighra water sample to make up 0.5g/l. this sample is filtrate from Whiteman filter paper to get final concentration of water sample.

The percentage of removal efficiency of Heavy Metals can be determined by:

$$\text{Metal ion removal (\%)} = [(C_0 - C_e)/C_0] * 100$$

where, C₀ is the initial metal ion concentration of test solution (mg/L), and C_e is the final equilibrium concentration of test solution (mg/L).

This sample tested from UV Spectrophotometer (Uv-2450) from 283nm, 287nm, 310nm, 312nm, 360nm, 392nm, 396.8nm, 540 nm wavelength respectively .Result shows percentage removal efficiency of metal ions (cn, pb, zn, cu, as, cd, ni, hg, cr) is 18.45%, 18.73%, 21.38%, 21%, 23.11%, 23.09%, 23.33%, 23.25%, 26.76%



Fig3. Pictorial View UV- Spectrophotometer

4. Conclusion

Experiment results showed that maximum removal of heavy metal (cn, pb, zn, cu, as, cd, ni, hg, cr) by tea waste is 26.7% (approx.).

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