

# STABILIZING AND CONVERTING LEACHATE INTO NON-TOXIC LIQUID FOR GROUNDWATER RECHARGE

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**Abstract** - Crab shell was chemically pre treated in order to improve its sorption performance to metallic ions in waste water. The pretreated crab shell was evaluated along with polymer as sorbent material for all heavy metals in leachate water by using equilibrium isotherms and kinetics of adsorption. Except the pretreatment crab shell are the untreated ones. The maximum heavy metals such as cadmium, cyanide, chromium uptake of pre treated crab shell was quantitatively evaluated using sorption isotherms. The pretreated crab shell showed an increased sorption, due to the partial transformation of amide to amine groups. The maximum sorption capacities of heavy metals on the pre treated crab shell were extremely high.

**Key Words:** leachate water, activated crab shell, aniline polymer, conc. sulfuric acid, hydrogen peroxide & ammonium per sulfate.

## 1. INTRODUCTION

A leachate is any liquid that in course of passing through extracts soluble (or) suspended solids, (or) any other component through which it passed. A physical appearance of leachate when it emerges from a typical landfill site and it is strongly odoured black. It contains lot of organic and inorganic compounds. In our project, the ultimate aim is to reduce all the toxic substance chemically such as chloride, Sulphur, nitrate and other harmful compounds by filter media. We introduced idea about filtration of leachate water by using polymer compound combine with finely powdered crab shell form a layer.

### 1.1 LITERATURE REVIEW

(1). Safaa M.Raghab et al, "Treatment of leachate from municipal solid waste landfill".

Leachate was treated by using an anaerobic treatment process, which was used by means of coagulation and flocculation. The main goal of this study is to utilize a natural low cost material as an accelerator to enhance the chemical treatment process.

(2). K.Y. FOO, B.H. HAMEED, "LEACHATE TREATMENT VIA ACTIVATED CARBON ADSORPTION PROCESS".

Water scarcity and pollution rank equal to climate change as the most urgent environment used in 21<sup>st</sup> century. The

activated carbon adsorption is powerful tool leading to superior improvement of environmental conservation.

(3). M. Koiv et al, "Zero-discharge solution for blackwater treatment at remote tourist facilities".

The main objectives of this study was to determine the treatment capacity of well mineralized Sphagnum in order to reduce BOD and COD values and nutrient concentration in leachate. The purification rate of the leachate depended on the contaminate rate, the outflow result also improved due to lowering over flow rate.

### 1.2 OBJECTIVE

- To study the chemical composition of the leachate.
- To treat the leachate using crab shell and treated effluent is analyzed.
- To convert the leachate into dischargeable standards.

### 1.2 SCOPE

- To find a economical method to purify the marsh water leachate.
- It reduces the water pollution which is the major problem today.
- The recycled leachate can be used to replenish the water table, farming.

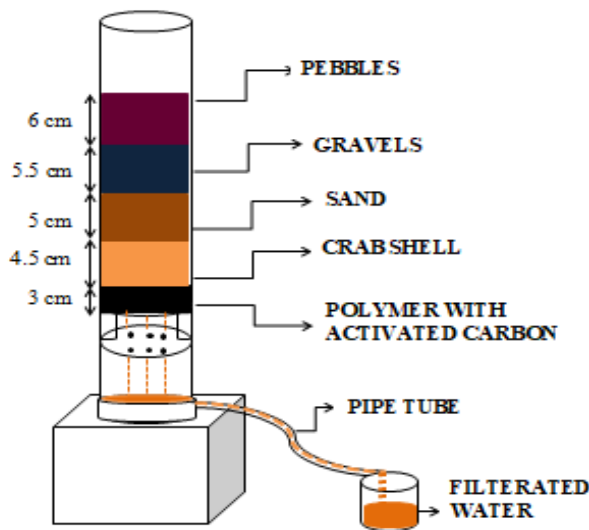
## 2. MATERIALS TO BE USED

- Finely powdered crab shell
- Aniline polymer
- Gravels
- Cobbles
- Sand
- Mesh

## 3. PREPARATION OF FILTER MEDIA

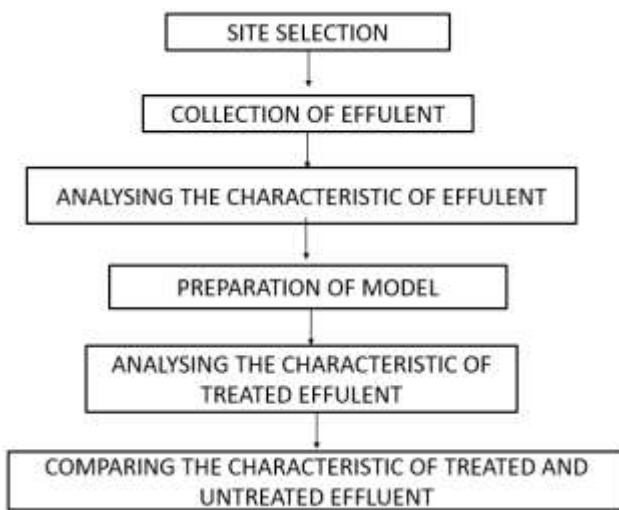
- Cobbles
- Gravels
- Sand
- Finely powdered crab shell (activated & raw) with aniline polymer.

### 3.1 FILTER SETUP



Filter setup diagram

### 4. METHODOLOGY



### 5. ANALYSING THE CHARACTERISTIC OF EFFLUENT

- Colour ,odour and taste
- pH value
- Turbidity
- Hardness
- VOC (volatile organic compound)
- TDS & TSS
- Heavy metals determination
- COD & BOD
- Dissolved oxygen

### 6. CHEMICALS PRESENT IN LEACHATE

- Organic salt
- Chloride
- Sulphate
- Nitrate
- chromium
- lead
- Arsenic

CHEMICAL TESTS	BEFORE TREATMENT
Appearance	Blackish
Odour	Sewage smell
pH	6.57
Total solids (mg/l)	4000
Ammonium nitrogen(mg/l)	82.8
Calcium (mg/l)	52.10
Potassium (mg/l)	4.85
Phosphate(mg/l)	2.2
Conductivity	11.4
COD(mg/l)	16
BOD(mg/l)	64

### 7. PREPARATION AND CHARACTERIZATION OF ACTIVATED CARBON

- Materials powdered in jaw crushers & kept in hot air oven for 24 hrs.
- Crab shell soaked in mixture of conc. sulfuric acid hydrogen peroxide & ammonium persulfate in proper ratio for Ac1 & Ac2
- Sample divided into 3 parts

#### Sample 1:

- Soaked in conc. sulfuric acid (w/v) at room temperature overnight.
- Carbonized material was washed with distilled water several times to remove free acid.
- Dried in hot air oven for 6 hours.

**Sample 2:**

- soaked in conc. Sulfuric acid & hydrogen peroxide in ratio 1: 0.4
- Kept in hot air oven for 12 hrs & same procedure as followed (AC1).

**Sample 3:**

- soaked in mixture of conc. Sulfuric acid & ammonium persulfate in ratio 1:0.1
- Kept in hot air oven at for 12 hrs. Same procedure (AC2).
- Dried activated carbon was stored in airtight container for subsequent experiments.



**Muffle furnace**



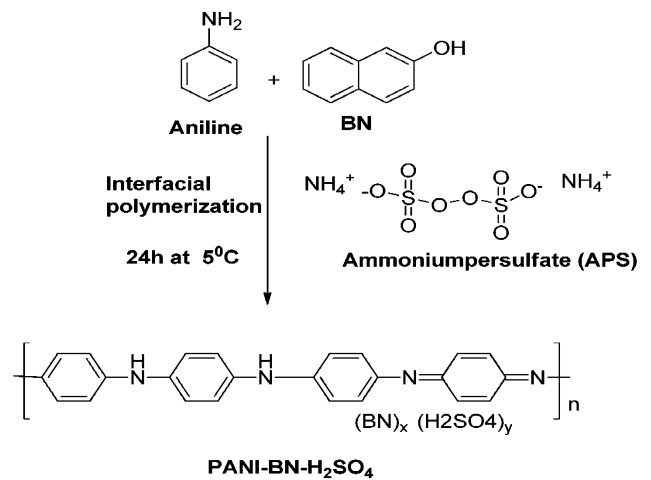
**Activated carbon (crab shell)**

**8. POLYMER SYNTHESIS**

Polymer - "Poly aniline"

**8.1 Materials required:**

- Aniline
- Ammonium persulfate
- Hydrochloric acid
- Distilled water
- Ice cubes
- Salt water



**8.2 Procedure:**

- Take required amount of aniline in the borosil flask, and fixed with the magnetometer with base ice cubes.
- Then add the hydrochloric acid and mix well then add sufficient required amount of ammonium persulfate in to the flask.
- "Magnetic pellet" has put into the flask and start the instrument, the magnetic pellet in the flask continuously rotates for more than 4 hours and flask is taken.
- The mixture in the flask is then filter by using filter paper and waters are separated, solvent are deposited in the filter paper.
- These filter paper is dried in a oven and then taken the dried poly aniline is then separated from the filter paper and collected then weighed.
- Thus, the polyaniline is prepared.



**Synthesis of polyaniline**



**Filteration of polyaniline**



**Polyaniline**

**9. EXPECTED RESULTS AND DISCUSSION**

- The leachate contains lots organic and inorganic components the polymer removes the hardness in the leachate water.
- The polymer poly aniline removes the heavy metals such as chromium, lead, arsenic, mercury.

CHEMICAL TESTS	BEFORE TREATMENT	AFTER TREATMENT
Appearance	Blackish	Brownish
Odour	Sewage smell	Sewage smell
pH	6.57	7.8
Total solids	4000	3600
Ammonium nitrogen(mg/l)	82.8	43.68
Calcium	52.10	38.07
Potassium(mg/l)	4.85	1.4
Phosphate (mg/l)	2.2	1.2
Conductivity	11.4	9.6
COD(mg/l)	16	8
BOD(mg/l)	64	56



**Before treatment**



**process**



**After treatment**

**10. CONCLUSION**

Using the combination of [activated carbon(crab shell) and polymer] ; removal efficiencies such as 41.25%, 52.6% ,73% ,29% ,54.5% ,84% ,50% ,87.5% of Ts , Ammonia nitrogen , Calcium, Potassium, Phosphorus, Conductivity , Cod , Bod respectively can be achieved. Apporoximately 20 minutes was sufficient time to allow the adsorption reaction to achieve equilibrium. It has been concluded that ; the reacted leachate water can safely recharge into underground (or) used for some other domestic purposes.Hence the process is an eco-friendly without use of special equipments ,electricity, less chemical usage and also with zero operational and less maintenance cost.

**11. REFERENCES**

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