Extraction Of Copper From Leachate By Graphene Oxide And 8-Hydroxyquinoline

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Abstract- *The aim of this research is to find out adsorption capacity of copper from leachate by adsorption process using Graphene oxide and 8-hydroxyquinoline in Moshi kachra depot, Pune. As copper is one of the most toxic heavy metal usually found in environment. In leachate concentration of copper was exceeding limit that is discharging limit in natural streams is 3mg/lit by guidelines limit for wastewater effluent set by National Environmental standard and Regulation Enforcement Agency . The adsorbent materia1 will be characterized by FTIR, XRD, XPS. The adsorption isotherms and kinetics of copper (Cu) onto adsorbent and the effect of temperature and ph on the removal efficiency will be thoroughly analyzed. The maximum adsorption capacity will be 85-95 percent mg/lit. Therefore, these materials can be used as effective adsorbent for Cu-containing wastewaters*

Keywords- 8-hydroxyquinoline, graphene oxide, isotherm, kinetics, Cu.

I. INTRODUCTION

Pimpri –Chinchwad, the twin city of Pune has a landfilling and waste dumping site, called PCMP Moshi Kachraa Depot, it is spread over 45 acres. Organic and inorganic waste is dumped at this site. The unbearable stench coming from dumping ground was felt from over 5kms away and it was huge problems as well as health hazard for people staying in those areas. Residents from those areas were agitating day in and day out to have the dumping ground remove from its place. Now BVG India Ltd was given responsibility to manage the PCMC Moshi Kachara Depo in 2011 and changed the entire scenario that existed for over 50 years. BVG emptied the entire area and processed the garbage.60 to 70%garbage was organic waste; the remaining 30 to 40% was plastic, metal, and glass. The organic waste is sent for processing to convert it in manure. Plastic is set up to fuel plant that processes all plastic waste collected from dumping ground and converts it to burnable fuel. Metal and glass were sent for recycling and remaining garbage was used for landfill Everyday approximately 800 tons of garbage is collected and brought to dumping ground. Earlier, the entire 800 tons of garbage was sent to landfill. Today only 100 to 125 tons of garbage is processed. Therefore, this dumping ground site will be available to take in and process garbage for next 70 years.

After landfilling, solid waste undergoes physiochemical and biological changes. The generation of leachate is decomposing solid waste, the percolating water becomes contaminated and flows out of waste material. As liquid moves through the landfill many organic and inorganic compounds, like heavy metals are transported in leachates. This leachates consists of heavy metal such as copper (Cu), nickel (Ni), lead (Pb), mercury(Hg), chromium (Cr) and zinc(Zn), iron(Fe). However copper is a common hazardous pollutant in water and wastewater and it is often released from several sources of industries like metal finishing processes, fertilizer, tannery operation, chemical manufacturing, metal surface treatments as plating refining paints and pigments.There are many methods for removal of metals ions from solution including, coagulation, flocculation, biological treatment. Adsorption processes have shown many many advantages like ease of operation, low cost. Graphene is new carbon material with two- dimensional structure and many excellent properties. The high specific area and good chemical stability make graphene a good material for adsorption treatment of leachate. However graphene is hydrophobic and tends to aggregate due to van der Waals interaction between neighboring sheets in water. Aggregation leads to great reduction in surface area, and is not beneficial for adsorption of heavy metal. Moreover the affinity of material to adsorb molecules is mainly determined H-bonding, van der Waals interaction. Therefore proper chemical modification of graphene is required to make it water soluble and have suitable surface properties to improve its water adsorption capacity. Graphene oxide(GO) is an important derivative of graphene and can be produced on large scale and at low cost by chemical exfoliation of graphite .The presence of many oxygen-containing functional group makes it water soluble and easily chemically modified, which can consequently improve the accessibility and affinity of GO to adsorbate molecules from leachate.

Fig1. Leachate pond at Moshi kachra depot

II. MATERIALS AND METHODOLOGY

STUDY AREA : Study area on Moshi Kachara depot located in pune for extraction of copper that is heavy metal from leachate by adsorption method using adsorbent Graphene oxide. Material for experimental work. (preparation of graphene oxide)

1. Graphite powder
2. Potassium Permanganate
3. Sulphuric Acid
4. Hydrogen Peroxide
5. Distilled Water
6. 8-hydroxyquinoline

Procedure for preparation of graphene oxide: Graphene oxide was synthesized from natural graphite powder by an improved hummer method. 3g of graphite and 18 g of potassium permanganate were slowly added into a 500 ml flask containing 360ml of concentrated sulfuric acid and 40 ml of phosphoric acid maintaining the reaction temperature at 35-40 degree Celsius with subsequent mixing for 12 hours at 50 degree Celsius. After cooling to the room temperature, the mixture was gradually dropped into 400 ml ice water, and 15 ml of 30 wt% hydrogen peroxide were slowly added to it under vigorous stirring changing the color of the mixture from black to light yellow. The obtained mixtures were washed with 30% sulphuric acid, ethanol and deonized water until pH 7.0 then separated the solid by centrifugal separation method. The resulting sample was freezed –dried under vacuum for 48hours. After that to modify the graphene oxide. Addition of 0.0004 ml 8hydroxyquinoline to the graphene oxide and analysis was done for FTIR (Fourier transform infrared spectroscopy), XRD (X-ray diffraction), XPS(X-ray photoelectron spectroscopy). After analysis the adsorbent will be applied by number of dosages and varying contact time to sample for getting actual result with high efficiency of adsorption of copper from sample in less time.

Methodology

Step1 – Selection of site and survey of site.
Step2 – Collection of leachate sample from site.
Step3 - Sample analysis by spectrophotometer and characterization of parameter.
Step4 – Identification of highly concentrated heavy metal.
Step5 –Selection of method for removal of heavy metal.
Step6 – Selection of adsorbent for treating sample
Step7 –Analysis and testing of adsorbent by FTIR, XRD, XPS.
Step8 –Treatment of sample by different dosage of adsorbent and contact time.
Step9 – Analyzing accurate result for treating sample for extraction of copper.
Step10 –Test the treated sample under spectrophotometer for removal efficiency of copper

III. DISCUSSION

The selected parameters for assessment of Leachate are pH, C.O.D, B.O.D, temperature, agitation speed, concentration of copper for 6 to 7 months will be analyzed from October to April by spectrophotometer to know the concentration. Also effect of pH variation, temperature variation, speed agitation, adsorption isotherm, and kinetics isotherm will be analyzed by standard procedure.

IV. CONCLUSION

The various parameter which affect concentration of copper increase or decrease, will be analyzed for better removal of copper from leachate with adsorption processes using graphene oxide and 8-hydxoyquinoline. This research will be useful for carrying out adsorption upto 85-95% of copper from leachate and will be free from high concentration of copper and used for other purposes like gardening etc and in the future will be helpful for environment.

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