ANALYSIS OF ADSORPTION TREATMENT METHOD USING LOW COST ACTIVATED CARBON FOR REMOVAL OF DYES FROM WASTE WATER AND LAND FILL TREATMENT AND THEIR MANAGEMENT

Dr. Pankaj Kumar Singh[1*], Sanjay Paliwal[2], Shailendra K. Mandal[3], Dr Shilpi Singh[4], Kanika Tuli[5], Prachi Srivastava[6]

Article History: Received: 12.12.2022 **Revised:** 29.01.2023 **Accepted:** 15.03.2023

Abstract

In recent times the common strategies for waste management at landfill destinations namely cremation, land-filling using different categories of waste and treatment of soils results in high pollution rate in the environment, moreover the ozone depletion is the horrible consequence of such faulty methods. In this work, a feasibility analysis is carried to inspect the existence of low cost activated carbon material to be used as a substitute for land-fill purpose. The solid waste assessing techniques including heavy metal fixations tests are investigated and data quality samples collected are tested. The testing profile profundities of somewhere in the range of 15 and 50 cm are intended to educate on early changes in the landfill waste parameters during their previous removal period. Testing inside this profundity run likewise gives spatial profile data on the properties of waste inside the primary receptor layer of the landfills. The analysis focuses a sample of 500 g which is acquired from each testing point dependent on amount of sample required for every investigation. With the help of newest tools and techniques such as BET surface area analyser, Ultraviolet /Visible Spectrophotometer and Carbon Sulphur Determinator: Eltra CS800 the task targets are investigated to achieve the accurate concentrations. The observation concludes that low cost activated carbon material (rice husk) has great potential to be used in For removal of dyes from waste water and landfill treatment. The low cost feature is the most promising and long time durability.

Keywords: Landfill, Activated Carbon material rice husk, Adsorption treatment, feasibility analysis.

[1*]Professor & Head-Department of Civil-R D Engineering College, Ghaziabad, U.P,
[2]Professor, Department of Mechanical, RDEC, Ghaziabad,U.P., [3]Associate Professor, Department of Architecture and Planning, National Institute of technology, Patna
[4]Associate Professor, Department of Management, Noida International University, Greater Noida, U.P., India
[5]Assistant Professor, Guru Nanak College of Pharmacy, Hoshiarpur, Punjab,India,
[6]Assistant Professor, R D Engineering College, Ghaziabad,U.P.,India

Email: [1*]India-p.mnavy@gmail.com, [2]hod_me@rdec.in, [5]sgnetiic@gmail.com, [6]pra1881chi@gmail.com

DOI: 10.31838/ecb/2023.12.s3.034

Aim to do this Research:

To evaluate the enrichment levels of carbon(with rice husk) and the degree of inorganic content in selected landfills with the view to investigating the possibility of using landfill composite as a suitable precursor for activated carbon, in order to improve the environmental sustainability of the landfills.

1. Introduction

Landfills

For sanitary waste implies and process where at the conclusion of routine activities, the waste to be discarded is compacted and filled with a sheet of dirt. When the disposal site reaches its final capacity, a plastic sheet is covered with the final layer of MSW. The land management system in the context of sanitary waste has proved to be the easiest and more suitable type of waste disposal. Modern land disposal systems must be planned, analysed and designed in accordance with the various scientific, engineering and economic principles. Final disposal site selection usually is based on preliminary site study results, engineering design and cost studies results and an assessment of environmental impacts. We used topography, hydrology, materials surrounding, current buildings and city growth (roads ...) as guidelines for site selection due to data limitations. Criteria for deciding that the dumping site was beyond the hydrology buffer region, forested areas, roads and established housing were identified. What were the conditions?

- ✓ Areas less than or equal to 230 square meters based on the contour map.
- ✓ 300 meters away from the main road
- ✓ 300 meters away from water bodies
- ✓ Minimal noise contamination from truck movement
- ✓ 40 kilometers away from the nearest population centers
- ✓ Located in area not crossed by major roads.
- ✓ Not located in areas of active agricultural land or near land under development

In India, recently solid waste management systems are assuming larger dimension in keeping with the municipal solid wastes. Many of the municipalities are taking appropriate actions to improve various component systems like collection of solid waste from generation areas, its transportation to processing and disposal site, utilizing the recycling potential of Municipal Solid Waste (MSW) and ultimately disposing off by land filling.

Deposit is the world's most commonly used disposal system for MSW. The waste disposal may be an uncontrolled open dump or a complete containment site designed to protect the aquatic environment. In contrast to engineered landfills, open dumps have no bottom liners to prevent leachate or top cover from draining into the fill to maintain moisture. These traditional waste disposal sites have no high-level coverage or other preventive measures for reducing atmospheric methane emissions. The main gasses produced from the decomposition of an organic proportion of solid waste in the waste disposal are methane and carbon dioxide. Compared to carbon dioxide, methane gas has a 21-fold global warming potential. The Intergovernmental Panel on Climate Change notes that these emissions account for 18 percent of the total atmospheric methane emissions of between 9 and 70 tg (megatons) per annum. Deposits are now the world's primary reservoir of ambient carbon, culminating in a "global warming" natural phenomenon.

Sanitary waste management is a waste treatment system that entails the preparation and execution of the concepts of sound engineering and building techniques. With its volume compacted, waste is distributed in thin layers and the daily coverage is provided to protect the environment. Waste is deposited without nuisance or danger for public health or contamination of soil or surface water, as defined in the covering and engineering principles. In developing countries, sanitary waste disposal is the best method when adequate sites and engineering principles are available.

Crude waste disposal has become a human risk due to the emission of toxic waste in the area and is therefore being examined. There is a vital assessment of the 3 medium matrixes of human impact involved with waste dumps, i.e. air , water and ground. In potential health initiatives a detailed risk study must be conducted. Specific analyses of the liquid content of the drainage revealed the existence of biogenic and xenobiotic chemical contaminants. Methanogenic decomposition of waste dumps contributes to the processing of methane and carbon dioxide gasses (up to 90%) along with carbon monoxide (CO), nitrogen (N_2), etc. The methane emitted from sources has a tremendous propensity for global change, 23 times the amount of carbon dioxide. Other contaminants and hazardous elements in waste pits are known as gasoline, hydrocarbon, organosulfur and heavy metals. There are thus some of the main problems of landfills that may damage human and natural systems. Leachates, waste gas and toxic substance are present in landfills

Over the past decade, waste generation rising enormously, touching 62 million tons annually in India. Out of 62 million tonnes, only 43 million tons of waste are collected every year, and only 28% were treated, according to former Environment Minister Shri Prakash Javadekar. The majority was poured into areas. The existing levels of waste disposal results in an annual landfill demand of 1.240 hectares. The waste generation is estimated to grow to 165 million tons by 2030, requiring a deposition area equal to the size of Bengaluru. When waste and pollution tend to be handled poorly, the whole world will quickly be in the muck. **(**Adeolu, A. O, Ada, **et al., 2011)**

Challenges faced by Landfill

Not lovely dump areas. The question is, regrettably, broader than just having massive waste dumps. Many health and environmental problems arise from waste dumping:

Odor Problem- Chemical-Physical Processes

Biological Treatment –Breeding Ground of Pests, Greenhouse Gas

In-vessel Composting – Open Window or Tunnel Composting.

Air Pollution

Activated Carbon:

Relatively simple and well-established production methods make activated carbons as one of the main candidates for many demanding applications. Mostly as catalyst supports, adsorbents, energy storage in super capacitors, Li-ion batteries, and CO2 capture or hydrogen storage application. Carbon-based materials have attracted considerable interest in many energy-related applications due to their abundance, chemical & thermal stability, processability & controlled structural & chemical characteristics.

Most of the commercial super-capacitors are based on powder activated carbon made from coconut shell. Porous carbons are used as electric double layer capacitor in electrode materials because of their higher specific capacitance, energy density, and power capability. The electric capacity of an electrode is affected by physical and chemical properties of activated carbon.

Due to the improved pore structure and low ash content, activated carbon is well- established for the anode reaction in fuel cell. The sum of minerals found in the activated carbon is ash material which is an significant element in the purification of organic solutions. Activated carbon containing oxygen surface functional groups, gives pseudo-capacitance effect lead to increases the specific capacitance of amount of energy storing in the super capacitor.

For developed nations, the primary production of activated carbons is used for the separation from factory waste gas of harmful substances. Also used for the processing of gas mixtures, recovery from industrial exhaust gas of important and beneficial materials, process gas purification from harmful impurities, solvent recovery or refinement of liquid carburants.

The alternative storage materials for hydrogen have been extensively examined in activated carbons, activated carbon fibers and graphite nana-fibre, since they have smooth textures, large pores capacity and strong chemical stability.. These properties enhance specific interaction between carbon atoms and gas molecules.

Adsorption through Activated Carbon

Inadequate color separation of harmful contaminants such as dyes from clothing runoff allows much of the new solutions not obsolete. The dyes and colors in traditional wastewater treatment systems are not eliminated because their complicated molecular structures make them relatively resilient to biodegradation, thermal and resistant. A variety of methods have in the past years been used to handle color containing wastewater, such as coagulation / flocking, chemical oxidation, reverse osmosis and adsorption. However, it was obvious from literature that, aside from sludge handling issues, the complexity of application and responding to biological processes, the limits of chemical coagulation / flocculation yield high quality effluent. Adsorption is more desirable than the monetary non-facing and possible harmful consequences of chemical oxidation, as well as the physical and financial disadvantages of reverse osmosis owing to the limited membrane life. Due to its cheapness and high quality of the handled effluents, adsorption was favored among all these approaches, in particular for well planned sorption processes. Small or harmful contaminants may occur via the adsorption cycle and small capital and operational costs.

Increasing strain on companies to become more aware of the climate and more focus on environmental conservation is now being talked of. Due to its possible human toxicity, water from a broad range of toxic compounds is badly polluted, particularly by heavy metals, aromatic molecules and thinner dyes. Currently almost all dyes are chemically synthesized, including naturally occurring dyes. The drainage of effluent from the garment sector into irrigation facilities or surrounding water-receiving structures is actually a significant source of environmental and safety problems. Wastewater produced from the textile industry is a versatile source for high color value additives, as well as other materials. Although textile teeth only contribute to a small portion of the overall wastewater volume after the tainting phase, they still stain it profoundly. The removal of color is deemed typically more essential because it is an esthetic issue and is therefore adverse to microbial living than to the removal of the soluble colorless pollutants. The water colour often interferes with the photosynthesis process of plants, as it reduces the infiltration of sunlight and thus significantly affects the environment. Lower amounts of these colors, as well as inducing disease, allergen and respiratory disorders, have also known to be harmful to human / animal wellbeing. Effluent dumps can be mixed up with surface and ground waters without proper treatment and ultimately be drawn into potable water. They are both extremely soluble water-soluble dyes and thus impossible to extract by specific chemicals.

For the treatment of colored waste water, adsorption using activated carbon has traditionally been used. The adsorption method would be successful if an adsorbent is inexpensive and ready to be used. Currently, most commercial systems use activated carbon as an absorbent in wastewater because of its excellent adsorption efficiency. The US Environmental Protection Authority has listed activated carbon adsorption as one of the better regulation technology possible. Therefore, it has no pollution issues, because it creates no sludge and provides good quality filtered water. When the method of adsorption is correctly configured, it generates a large amount of effluent treated. An effort has been pursued to identify affordable substitute adsorbents to rising care costs.

Disposal of hazardous waste is both complicated and expensive. Value-added goods are made in two forms from commodities that contain solid waste: first, waste management and secondly increased income production. In order to solve these environmental, ecological and societal health problems, an simple, effective, economic and efficient method of dyes removal should be attempted and given. Produced by inexpensive natural precursors utilizing environmentally sustainable methods, practical activated carbon products are currently extremely appealing to material chemistry. Adsorption was investigated & optimized with locally accessible, environmentally safe & cost-effective adsorbents.

Activated carbons of agricultural waste products have been identified as low-cost adsorbents and are a strong base for removal of dyes. Low-cost farm waste adsorbents will also be feasible alternatives for the disposal of polluted waste water with the activated carbon. Double purpose is to produce activated carbons from agricultural by-products. First, it converts unwanted, agricultural surplus waste which is manufactured annually by millions of kilograms into useful, value added adsorbents. Second, growing usage of activated carbons to extract organic chemicals and environmental or economic metals is being rendered in water. Based on the properties of individual adsorbents, surface alteration degree and initial adsorbent concentration, the dye adsorption capacities of agricultural by-products adsorbents differ. The use of agricultural by-products is now in accordance with the wealth-to-health management approach principle. **(Alothman, Z.et al.,(2011)**

The following specific objectives will be addressed in order to achieve the overall aim:

- To determine the elemental composite of landfills composite in relation to depth
- To determine the heavy metals concentrations in the landfills composite
- To determine the correlation of the landfill depth and age as a functionality of precursor suitability & possibility of using the solid waste composite as a precursor for AC production.

Applied Methods and Procedure:-

In this Paper we study the property of Activated carbon prepared from Rice Husk, various process parameter on adsorption and effectiveness of Activated Carbon for removal of dyes.

Dyes are particularly removed using various adsorbent i.e. orange peel, neem seed, oil cake, date palm, olive shell, charcoal etc has been exposed for its removal.

Activated carbon prepared from rice husk has shown significant removal properties with respect to other adsorbent

Among the various types of dyes removed activated carbon has selectively used for removal of Methylene blue dye which has been extensively used in textile industry.

Find the % of dye Activated Carbon by adding iodine solution using adsorption treatment method.

Method:- Take a pieces of wood coal grinding them in fine pieces and sieving them. Again sieve the sieve sample to remove Power form .Prepare the furnace as shown in figure.

Put the sample at the different pressure that's why we can the provide the different temperatures for individual samples. Providing temperature about **900^0C till 10 min**. After that remove all sample, weight all sample. **Light weight sample will be the purest form of Activated carbon**.

Fig 1:- Setup of Furnace to make Activated Carbon

Fig 2:- Light weight purest form of Activated Carbon sample

(a) Then after prepare Iodine solution for titration:-

Here taking tube of charcoal(1.005 gm) then add HCL and mix them properly (the charcoal become wet) after that mix 25 ml iodine solution and sack . them properly(by cover mouth with thumb) ,then after as seen in figure prepare all sample tube (1,2,3,4 etc sample) after that Put all the sample for 20-24 hrs at room temperature

Fig 3:-Prepare Iodine Sample

(b) Titration Process Procedure: -

Firstly we take empty beaker, weight it then add 10 ml solution in the beaker then after Put the beaker in start titration by open the burrate.

Fig 4 :-Titrating all the sample

Reactions:-

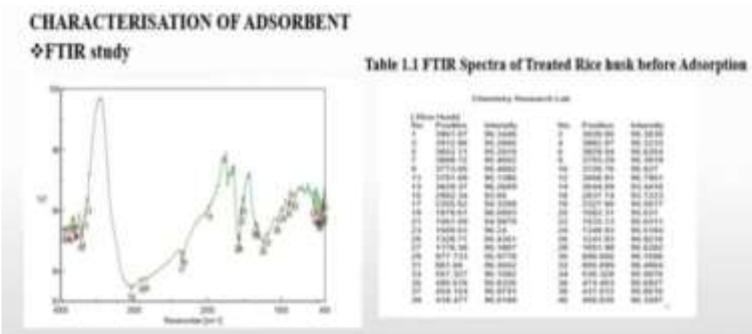
$2Na_2S_2O_3+I_2$----→ $Na_2S_4O_6+2NaI$(Titrating all sample and check)

Dye Activated: - 0.7 ml $Na_2S_2O_3$ @ 31.5 ml I #2.8ml left: 10 ml=7.5%

= 92.5% ,

Means % of Dye Activated Carbon = 92.5%

2. Result and Discussion:



Graph 1:-Final Characteristics of FTIR Spectra of treated Rice Husk before Adsorption Graph

Here several peaks shows the treated Rice husk are composed of different functional groups which are responsible for adsorption of MB Dyes.

Morphology Study

The surface morphology of adsorbent will be found by scanning Electron microscopy (SEM). The surface morphology of untreated rice husk materials is different from the treated ones as the treatment may significantly alter the physicochemical properties and porosity of the materials. **The treatments partially remove protective thin wax** on surface. The modified surface appears to **be rough,** indicating that the surface had been covered with organic molecular layer. The availability of pores and internal surface is evidently presented in the SEM picture of the biomass

Surface Morphology of Adsorbent		
Element	**Wt%**	**At%**
CK	**81.88**	**88.16**
OK	**10.76**	**08.70**
MgK	**01.57**	**00.83**
Sik	**00.69**	**00.32**
PK	**03.47**	**01.45**
KK	**01.64**	**00.54**
Matrix	**Correction**	**ZAF**

Adsorption Experiment

Effect of Operational Conditions

MB was taken as the model adsorbent in this study. The stock dye solution was prepared by dissolving 1g of MB in one litre distilled water. The pH of the experimental solutions was adjusted by addition of either dilute 0.1 M HCl or 0.1 M NaOH solutions. The pH measurements were performed using a digital pH meter.

The experimental solutions were obtained by diluting the stock dye solution with deionised water to give the appropriate concentration range of experimental solutions. The concentration of the residual dye was measured using UV/visible spectrometer at a λmax corresponding to the maximum adsorption for the dye solution (668 nm) by withdrawing samples at fixed time intervals.

. The influence of pH (2, 4, 6, 7, 8, and 10), contact time (30, 60, 90, 120, and 150min) and initial Methylene blue concentration (10, 20, 30, 40, 50, 60, 70, 80, 90, and 100 mg/lit), in temperature (15°**C,** 25°C, 35°C, 45°C**,** and 55°C), adsorbent (0.20, 0.40, 0.60, 1, 1.20, and 1.40g), on the performance of the rice husk carbon evaluated.

Used Instruments In Adsorption Experiment

Figure 1.6Adsorption Experiment

Fig 4 :- Adsorption Experiment instrument

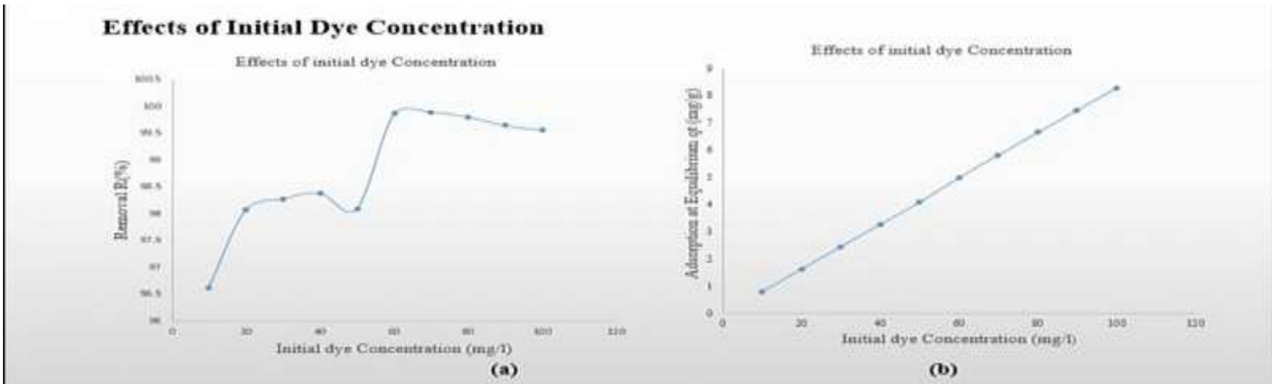
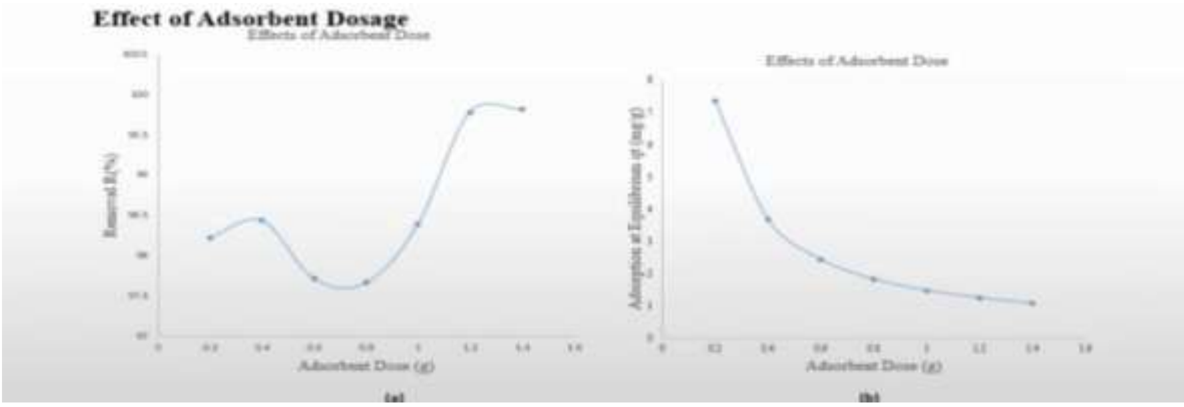


Figure.1.7. Effect of Initial Concentration the Removal Efficiency Methylene blue using Activated rice Husk Carbon (a) Removal R (%), (b) Adsorption at Equilibrium qt (mg/g): Conditions: pH = 6.4, t= 150 minutes, Adsorbent= 0.60g, and T= 30 ±2°C.

Graph 2:-Effect of initial Dye Concentration on the removal efficiency of Activated Rice husk

Effect of Initial Dye Concentration on the Removal Efficiency of Activated Rice Husk

Here in figure uptake of MB was rapid at lower concentration and as concentration reached at Eq. Concentration (70 mg/l) the amount of MB absorbed was high (99.9%) then after % decreases but amount of MB absorbed/unit mass of absorbent with increase in MB Concentration.



Graph 3-Effect of Adsorbent Dosages

EFFECT OF ADSORBENT DOSAGES

% Adsorption increased with the increased in adsorbent dosages it reaches the equilibrium dosages(1.4g) and after reaching equilibrium the %age removal is decreases with increasing the adsorbent dosages. Increasing the adsorbent dosages leads to increase of active site for adsorption. But this phenomenon may not lead to high adsorption capacity and adsorption efficiency of adsorbent due to over load of carbon area is decreased

.

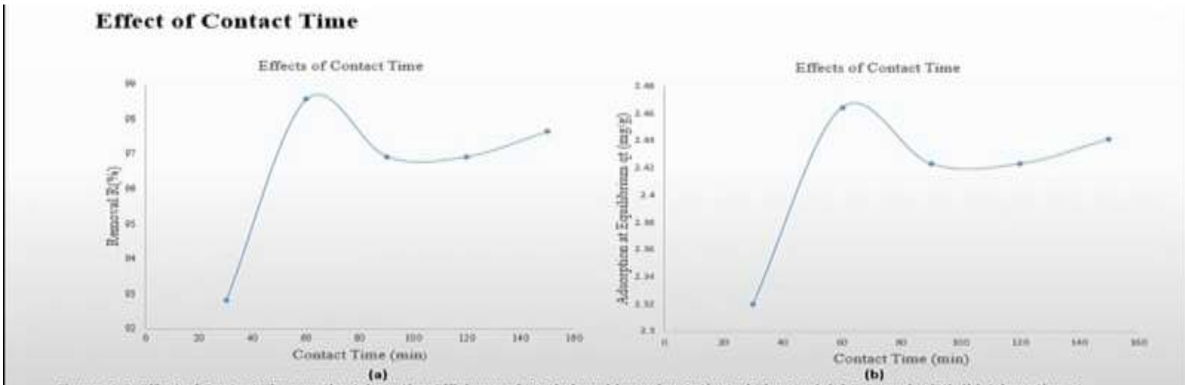


Figure. 1.9. Effect of Contact Time on the Adsorption Efficiency of Methylene blue using Activated Rice Husk (a) Removal R (%), (b) Adsorption at Equilibrium qt (mg/g): C0=30 mg, PH =6.4, T= 30 ±2°C, Adsorbent 0.60g

Graph 4:-Effect of Contact Time

Effect of Contact Time
On the amount of dye observed on the absorbent is investigated at initial concentration of 30 mg/l and temperature at 30^{0}C . The system was subjected to an agitation speed of 150 rpm at different contact time. In figure seen a rapid adsorption of Methylene blue dye on adsorbent was observed at the initial stage of the adsorption and equilibrium is attained within 60 min.

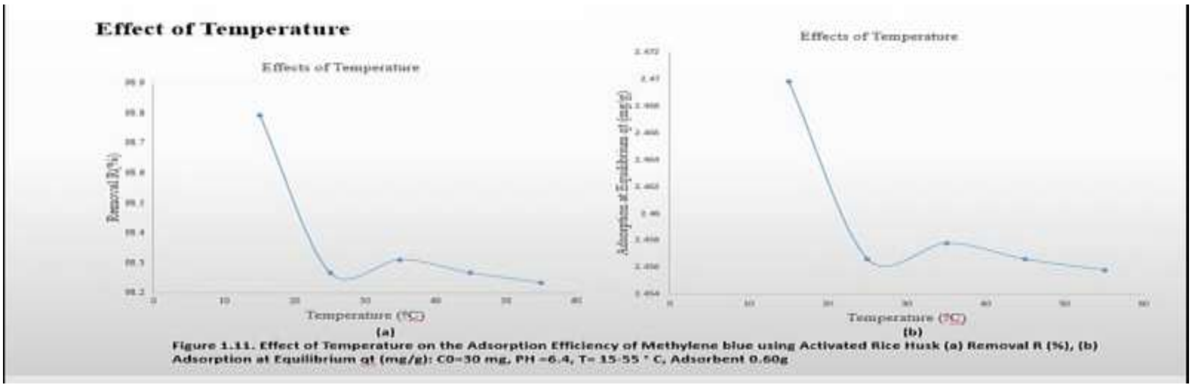


Figure 1.11. Effect of Temperature on the Adsorption Efficiency of Methylene blue using Activated Rice Husk (a) Removal R (%), (b) Adsorption at Equilibrium qt (mg/g): C0=30 mg, PH =6.4, T= 15-55 ° C, Adsorbent 0.60g

Graph 5:-Effect of Temperature

Effect of Temperature
On the adsorption of dye over activated rice husk, experiments were performed at temperatures of (15°C, 25°C, 35°C, 45°C, and 55°C).
In figure presents the influence of temperature on the adsorption of dye onto activated Rice Husk. As it can be seen, removal of MB decreases with increasing temperature.
This suggests that the adsorption of Mb on activated rice husk follows exothermic process.

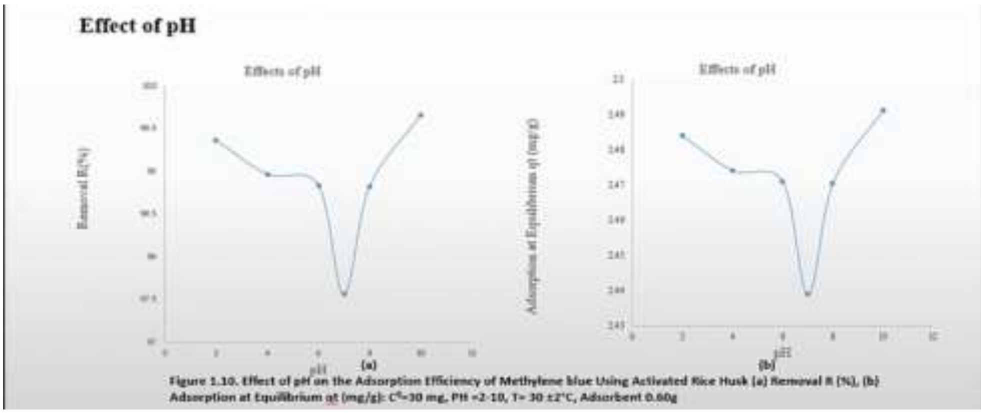
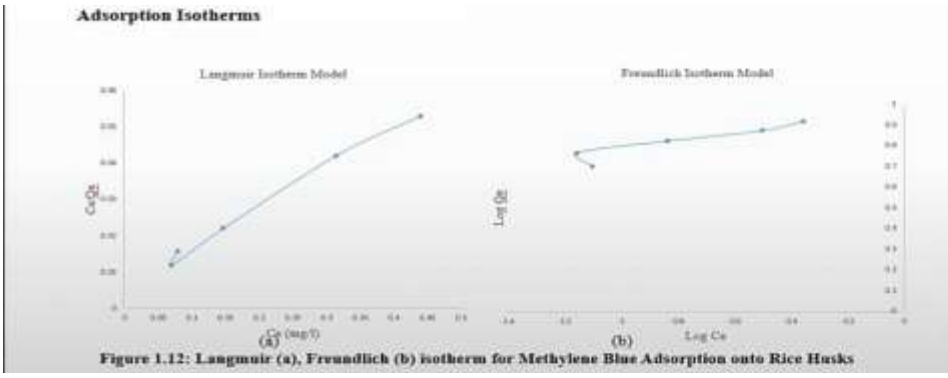


Figure 1.10. Effect of pH on the Adsorption Efficiency of Methylene blue Using Activated Rice Husk (a) Removal R (%), (b) Adsorption at Equilibrium qt (mg/g): C⁰=30 mg, PH =2-10, T= 30 ±2°C, Adsorbent 0.60g

Graph 6:-Effect of pH

Effect of pH :-
This Graph were carried out to see the effect of pH on adsorption MB on adsorbent in the pH range of 2-10. The pH of the solution was maintained by adding hydrochloric acid or sodium hydroxide.
. The result obtained at 30 mg/l initial concentration using adsorbent. As it can be seen in figure, the removal of methylene blue increased with increasing of pH of mother solution in basic solution.
. Lower adsorption of Methylene blue is observed at Neutral pH is probably due to the absence of H+ ions and OH-. The high observed on when acidic and basic solution but the higher adsorption reached in basic solution at pH-10. **(Karago, S., et al.,2008)**



Graph 7:-Methylene Blue Adsorption onto Rice Husk.

3. Result

The result obtained in presented figure ,as it can be seen a rapid adsorption of Methylene blue dye on absorbent was observed at the initial stages of the adsorption and equilibrium is attained within about the 60 min.

Such uptake indicates high degree of affinity towards dye molecules via chemisorption's. After the rapid uptake, the capacity of the adsorbent become exhausted and te adsorption would be replaced by the transportation of the dye from the external sites to the internal sites of the adsorbent particles.

Languir, Freundlich isotherm for Methylene blue adsorption

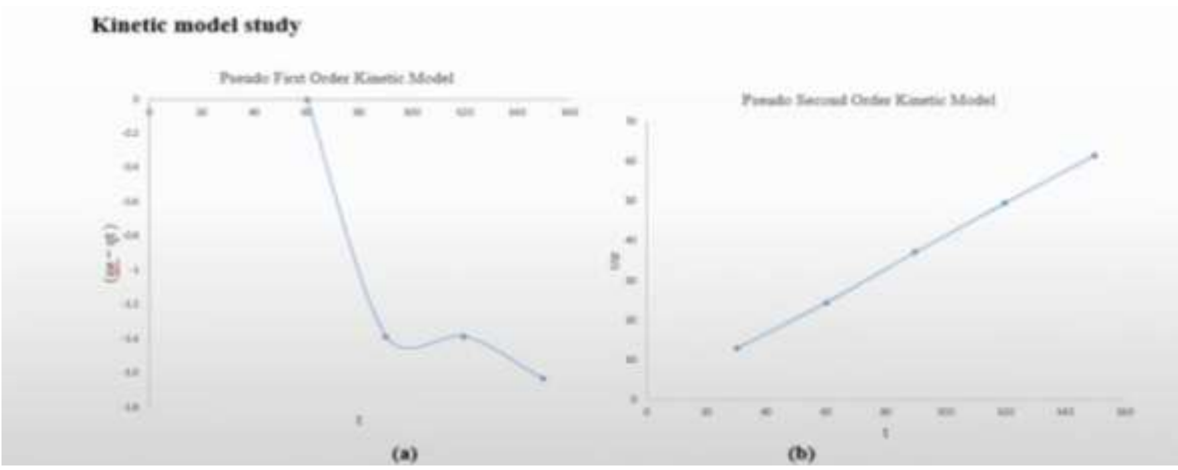
The Languir isotherm is based on the assumption that the adsorption process takes place at specific homogeneous sites within the adsorbent surface and that once a pollutant occupies a site, no further adsorption can take place at that site. RL= 0.006 which was found between (0<RL<1) and R2= 0.9934. From these two values indicated that Langmuir isotherm gives a best fit.

Freundlich isotherm is the most basic known model for multilayer adsorption. It leads to an empirical equation which describes a heterogeneous system. This model is applied to adsorption on heterogenous surfaces with an interaction between adsorbed molecules.R2=0.8794 from these values indicated that Freundlich isotherm not fit to this Adsorption.

The Kinetic study is important in determining the efficiency of the adsorption .Kinetic models have been exploited to test the experimental data and to determine the mechanism of adsorption.

Kinetic Model Study

Kinetic study is important in determining the efficiency of adsorption. Kinetic models have been exploited to test the experimental data and to determine the mechanism of adsorption.



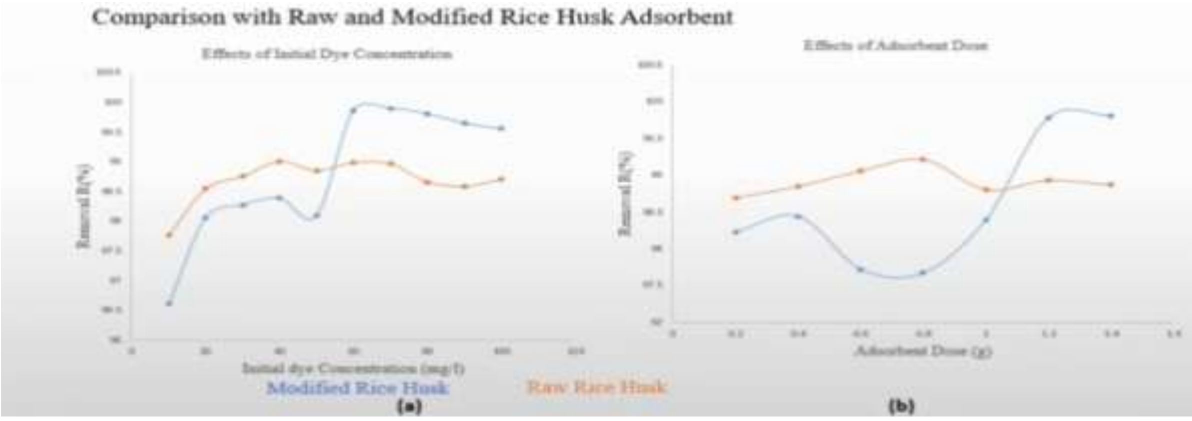
Graph 8 –Kinetic Model Study

Table-1 Pseudo-First order Kinetics Parameters for Methylene Blue adsorption.

Adsorbent	qe.exp(mg/l)	qe.cal(mg/l)	K1(min-1)	R^2
Rice Husk	2.4642	2.4436	0.0375	0.725

Table-2 Pseudo-Second order Kinetics Parameters for Methylene Blue Dye adsorption.

Adsorbent	qe.exp(mg/l)	qe.cal(mg/l)	K1(min-1)	R^2
Rice Husk	2.4642	2.4545	0.3965	0.9997



Graph 9: Comparison with Raw and Modified Rice Husk Adsorbent

4. Result and Discussion

In this study, Activated rice husk was tested and evaluated as a possible adsorbent for removal of Methylene blue dye from its aqueous solution in a batch adsorption experiment. The adsorption experiments were conducted for a wide range of solution pH, adsorbent dosage , temperature, initial concentration and contact time.

. Experimental results have shown that, the amount of dye adsorption increased up to reaching equilibrium point with decreasing the initial concentration, adsorbent dosage, contact time, and temperature.

. Over 99.99% removal efficiency were achieved for the given dosage, with respect pH increasing of basicity of solution will increases removal efficiency. Equilibrium adsorption and kinetic data were fitted with Langmuir, Isotherms and by pseudo- second- rate respectively. This suggests that ARHC can be used in the removal of dyes from waste water.

5. Conclusion

In conclusion, these research findings provide essential information on the potential used of municipal landfill composite as a precursor for AC generation and its characterization. Landfill composites were considered suitable for AC activation, except for the degraded nature and inorganic content in the closed landfill. The AC quality in terms of surface area and adsorption capacity increases with depth. With a Langmuir surface of 636 m2 /g and MB adsorption capacity of 190 mg/g, the AC could be used to adsorb a range of cationic dyes and pollutants.

The waste disposal composite of both waste disposal areas has been found to be suitable for the precursor of carbon generation. This represents a new source of precursor for carbon activation and a potential new waste composite reuse option. It provides an optimized waste collection network interface.

Both waste sites had a substantial difference in depth in adsorption capability and surface area of the activated carbon produced, although the difference in age did not have a definite impact. Higher precursor depth generally resulted in higher carbon content. This is a recent discovery that demonstrates the connection between site depth and activated carbon consistency.

The part of this research work had shown that both active and closed landfill investigated consist largely of decomposed materials across the sampled depth. This is a strong indication that aerobic landfill condition existed within these layers. The degradation process of waste within this depth is expected to be accelerated due to temperature range above 25 °C and moisture content above 32 %. The use of SEM/EDX and FTIR for precursor characterization present a faster and non-destructive method applied for the first time to these samples been investigated.

Result Limitation

As for any of the landfill conditions, the biggest constraint in the current findings relies significantly upon the form of waste disposed of, environment and waste management activities. Tests for all waste sites are challenging to generalize.

Suggestions for future Scope:

The finding reported here present a single profile evaluation of the landfills to create the basis for an in-depth look at resource potential in the landfill located in Lagos, Nigeria. A deeper sampling of the landfill to establish spatial trend between profiles is necessary in order to design a robust landfill mining strategy and activation conditions. A study of quality optimization conditions for the activation process using landfill composite is necessary to enhance the use of this management option.

AC regeneration studies are necessary to enable better understanding of management strategy for the exhausted AC. Evaluating adsorption potential of the landfill leachate content onto the activated carbon is highly desired to determine the possibility of deploying it for this purpose. There is need for the government to enact policy and strategy to prevent continuous buildup of non–biodegradable waste (Polythene) in active landfill. This type of waste is best recycled rather than disposed on the landfill. The using of anaerobic landfill composite as a precursor is necessary to assess its suitability for the production of activated carbon. It will help establish the possible application of this conversion strategy to both anaerobic landfill composite common in the developed countries and aerobic composite peculiar to developing countries.

6. References

Adeolu, A. O, Ada, O. V., Gbenga A. A., Adebayo, O. A. (2011). Assessment of groundwater contamination by leachate near a municipal solid waste landfill. African Journal of Environmental Science and Technology, 5:933-940.

Alothman, Z., Habila, M.A. and Ali, R, (2011), “Preparation of activated carbon using the copyrolysis of agricultural and municipal solid wastes at a low carbonization temperature”, The Second International Conference on Biology, Environment and Chemistry. United Arab Emirates

Alslaibi, T.M., Abustana, I., Ahmad, M.A., AbuFoul, A. (2013). A review production of activated carbon from agricultural by products via conventional and microwave heating. J Chem Technol Biotechnol, 88: 1183–1190.

Arunrat C. and Sukjit K., (2014), “Preparation of Activated Carbon Derived from Rice Husk by Simple Carbonization and Chemical Activation for Using as Gasoline Adsorbent”, International Journal of Environmental Science and Development, 5(2), pp. 71-175.

Ayranci, E. and Duman, O. 2015. Adsorption behaviors of some phenolic compounds onto high specific area activated carbon cloth. J. Hazard. Mat. In press.

Dabhade, M. A., Saidutta, M.B. and Murthy D.V.R.,(2009), “ Adsorption of Phenol on Granular Activated Carbon from Nutrient Medium: Equilibrium and kinetic Study.” International Journal of Environmental Research, Vol. 3, No.4, Pp. 557-568.

Deng, H, Guoxue Li, Hongbing, Y, Jiping, T & Jiangyun, T 2010, ‘Preparation of activated carbon from cotton stalk by microwave assisted KOH and K2CO3 activation’, Chemical Engineering Journal, vol.163, pp.373-381.

Dutta S, Bhattacharyya A, Ganguly A, Gupta S, Basu S (2011), “Application of response surface methodology for preparation of low-cost adsorbent from citrus fruit peel and for removal of methylene blue”, Desalination, 275, 26–36.

Foo, K.Y., Hameed, B.H. (2012). Coconut husk derived activated carbon via microwave induced activation: Effects of activation agents, preparation parameters and adsorption performance. Chemical Engineering Journal 184: 57– 65.

Foo, K.Y., Hameed, B.H. (2012b). Mesoporous activated carbon from wood sawdust by K2CO3 activation using microwave heating. Bioresource Technology 111: 425– 432.

Foo, K.Y., Lee, L.K., Hameed, B.H. (2013). Preparation of activated carbon from sugarcane bagasse by microwave assisted activation for the remediation of semi-aerobic landfill leachate. Bioresource Technology, 134:166–172.

Foo, K.Y., Lee, L.K., Hameed, B.H. (2013a). Preparation of tamarind fruit seed activated carbon by microwave heating for the adsorptive treatment of landfill leachate: A laboratory column evaluation, Bioresource Technology. 133, 599–605.

Foo, KY & Hameed, BH 2011a, ‘Microwave assisted preparation of activated carbon from pomelo skin for the removal of anionic and cationic dyes’, Chemical Engineering Journal, Vol.173, no.2, pp.385– 390.

Foo, KY & Hameed, BH 2011b, ‘Preparation of activated carbon from date stones by microwave induced chemical activation: Application for methylene blue adsorption’, Chemical Engineering Journal, vol.170, no.1, pp.338–341.

Fu, K., Yue, Q., Gao, B., Sun, Y., & Zhu, L. (2013). Preparation, characterization and application of lignin-based activated carbon from black liquor lignin by steam activation. Chemical Engineering Journal, 228: 1074–1082.

Gercel, O., Ozcan, A., Ozcan, A.S., Gercel, H.F.(2007). Preparation of activated carbon from a renewable bio-plant of Euphorbia Rigida by H2SO4 activation and its adsorption behavior in aqueous solutions. Appl. Surface Sci. 253: 4843–4852.

Gin, W. A., Jimoh, A., Abdulkareem, A. S. and Giwa, A. (2014),. “Production of activated carbon from watermelon peel", Int. J. Sci. Eng. Res, 5, 66 – 71.

Hameed, BH, Ahmad, AL & Latiff, KNA 2007, 'Adsorption of basic dye (methylene blue) onto activated carbon prepared from rattan sawdust', Dyes and Pigments, vol.75, pp.143–149.

Kalderis D., Koutoulakis D., Paraskeva P., Diamadopoulos E., Otal E., Valle J.O.D. and Fernandez-Pereira C., (2008), "Adsorption of polluting substances on activated carbons prepared from rice husk and sugarcane bagasse." Chemical Engineering Journal, Vol. 144, No.1, Pp. 42–50.

Kannan, N & Sundaram, MM 2011, 'Kinetics and mechanism of removal of methylene blue by adsorption on various carbons: A comparative study', Dyes and Pigments, vol.51, pp.25-40.

Karago, S., Tay T., Suat U., Erdem M. (2008). Activated carbons from waste biomass by sulfuric acid activation and their use on methylene blue adsorption .Bioresource Technology. 99: 6214–6222.

Kumar U. and Bandyopadhyay M.,(2006), " Fixed bed column study for Cd(II) removal from wastewater using treated rice husk." Journal of Hazardous Materials Vol. B129 , No.1-3, Pp. 253–259.

Li W., Hua T., Zhou Q., Zhang S. and Li F., (2010), "Treatment of stabilized landfill leachate by the combined process of coagulation/flocculation and powder activated carbon adsorption." Desalination, Vol. 264, No.1-2, Pp. 56–62.

Malik, PK 2013, 'Use of activated carbons prepared from saw dust and rice-husk for adsorption of acid dyes: A case study of Acid yellow 36', Dyes and pigments, vol.56, pp 239-249.

Memon, GZ, Bhanger, MI, Akhtar, M, Talpur, FN & Memon, JR 2008, 'Adsorption of methyl parathion pesticide from water using watermelon peels as a low cost adsorbent', Journal of Hazardous Materials, vol.138, pp.616–621.

Olayiwola OO. (2013), "Economic of cassava peel activated carbon in treatment of effluent from cassava processing industry", International Monthly Referred Journal of Research in Management and Technology, 2, 69-71.

Prahas, D, Kartika, Y, Indraswati, N, Ismadji, S, (2008), "The use of activated carbon prepared form jackfruit (artocarpus heterophyllus) Peel Waste for Methylene Blue Removal", J. Environmental Protection Sci, 2: 1-10.

Sajab, MS, Chin Hua, C, Sarani, Z & Poi Sim Khiew 2013, 'Cationic and anionic modifications of oil palm empty fruit bunch fibers for the removal of dyes from aqueous solutions', Bioresource Technology, vol.128, pp.571–577.

Shabiimam M.A. and Dixit A. (2012), "Adsorption of O-Cresol in landfill leachate using Activated carbon". International journal of Environmental science and Development. Vol 3, No.2, Pp. 189-193.

Shafeeyan, M., S., Wan Daud, W. A., Houshmand, A., Shamiri, A. (2010). A review on surface modification of activated carbon for carbon dioxide adsorption, Journal of Analytical and Applied Pyrolysis. 89: 143–151.

Singh V. and Mittal A.K. (2009), "Toxicity Analysis and Public Health Aspects of Municipal Landfill Leachate: A Case Study of Okhla Landfill, Delhi", 8th World Wide Workshop for Young Environmental Scientists, Pp.1-8.

Suzuki, RM, Andrade, AD, Sousa, JC & Rollemberg, MC 2007, 'Preparation and characterization of activated carbon from rice bran', Bioresource Technology, vol.98, pp.1985–1991.

Tumbas, I. I., Dalmacua, B., Tamas., Z. and Karlovic, E. 2008. Reuse of biologically regenerated activated carbon for phenol removal. Water. Res. 32(4): 1085-1094.

Vidic, R.D., and Suidan, M.T. 2011. Role of dissolved oxygen on the adsorption capacity of activated carbon for synthetic and natural organic matter. Environm Sci. Tech. 25(9): 1612- 1618.