LITERATURE REVIEW

1. Alemayehu A. et. al. (2008); Birbira (militia ferruginea) used to activate carbon to adsorb lead (II) and study on the contact time, adsorbent dose, lead concentration, temperature. Adsorption runs for 3h of dose 4 gm and 93.3 % adsorption of lead at pH-4.0 It is observed that amount of birbira increase the more Pb(II) adsorbed. Adsorption indicate the positive of free energy and it is endothermic according to the Frundlich isotherm. 3.3 mg lead adsorbs per gm and follows first order kinetics.

2. Qin L. et. al. (2008); According to present research separation of Pb (II) from the water solution. The adsorption processed through batch method at different pH, initial concentration of metal ion. The study revealed that in acidic solution weak adsorption examined by data when fitted into Langmuir and Frundlich isotherm and report state that peanut husk applied for adsorption of Pb(II)>Cr(II)>Cr(III) in order.

3. Nirmal K. et.al.(2009); Biosorbent use for heavy metal removal of five green marine macroalgae. Biosorbte Cd, Hg and Pb by the macro algae at different concentration and different contact time but Cd adsorb greatly at 20 mg/l but all metal results highest adsorbed on 120 min. adsorption enhanced clear by the Frundlich and Langmuir isotherm.

4. Innocnt O. et. al.(2009); Recent investigation revealed that heavy metals are the responsible for the adverse effect on the environment and the removal of metal from wastewater treated with cheap or low cost adsorbent i. e Neem leave adsorb Cu(II), Ni(II) and Zn(II), Pb(II). Neem as adsorbent work effectively at the dose of 1 gm adsorb 68.75%. At different PH, concentration and adsorbent dose adsorption examined.

5. Opeolu B. et. al (2010); Use of biomaterial for the removal of heavy metal from aqueous wastewater released by domestic and agriculture and industries. Present work evaluate the utilization of biomass various adsorbent includes living or dead biomass of algae, fungi and animal by product and cellulose. These materials have good capacity for the removal of metal from water by the chemisorption and physisorption

6. Sudha M. et. al. (2011); The concentration of nickel ion minimized from the adsorption from water or waste water by using low cost adsorbent or biomass which prepared from dry leaves powder of pinus gerardiana. Adsorption evaluated with the result of variation observed in pH, contact time, initial metal concentration. Ni ion adsorb more with increase the pH and maximum removal observed at pH -7. Batch method used to abstract the data and evaluated by frndlich adsorption isotherm.
7. Ugwekar R. et. al (2012); emphasized the disadvantages of related to activated carbon and replaced by the new adsorbent made from the agricultural waste, industrial byproduct for adsorption of metal and minimize metal concentration water treatment generally by the two kind of adsorbent organic and inorganic. Most cheap and easily available precursor are bark tannin rich material nut hull, fruit peel, cellulose are organic adsorbent. According to study inorganic adsorbent are metal oxide, hydroxide, clay mud zeolite, soil and ore studies on different separation process.

8. Hossain M. et. al (2012); emphasized banana peel used for adsorption of copper. waste of banana cut washed and made small piece powder and used as adsorbent to remove copper. Experiment revealed that adsorption on banana peel depend upon adsorbent size, adsorbent dose and contact time, pH and temperature data fit with Langmuir and frundlich adsorption isotherm result found that 94% copper adsorb on banana peel.

9. Renge V. et. al. (2012); This research state that contamination due to heavy metal remove by applying adsorption process. the adsorbent used for the removal of heavy metal from the waste water by low cost biomaterial i.e. Chitosan, Egg shell. These adsorbent processed by cold water mixed with 4% HCl for 36 h. egg shell and chitosn treatment to remove Cr(VI), Iron (III), Ni(II) and Hg(II). Which supported by Langmuir isotherm and 90% to the metal ion can be extracted.

10. Suryan et.al (2012); Dead biomass applied for the adsorb lead, cadmium, nickel and copper from aqueous medium. Adorbent prepared from the waste material or biomass which low cost biomass. The experiment revealed that waste biomas (P. Chrysognum) adsorb 56 mg/gm of NI. Adsorbent formed from the fermentation waste, red mud, whiskey distillery spent wash lyophilized adsorb Cu 19.7 mg/gm. The waste of paper mill for the low cost biomaterial as adsorbent.

11. Akhtar A. et.al (2012); this experiment focus on the removal of As(v) using adsorbent prepared from the waste of wheat (Triticum aestivum), rice (oryza sativa), peanuts (Arachis hypogaea) and banana (musa accuminata), sohanjana (moringa oleifera) used as adsorbent for the removal of metals using batch experiment. At pH 7.8 and 1M NaOH mixed with 1M HCl solution. From the study found that high percentage of As removed from these low cost biomaterial

12. Kameshwara R. et. al (2012); This study revealed that wood ash used as adsorbent for the removal of Pb and Co. Tada Industries waste released out which used as sample for experiment and determine the concentration of Pb (lead) present in sample on the basis of
parameter pH, effect of amount of wood ash. According to these study Pb remove or adsorb by the use of wood ash as absorbent.

13. Logeshwar A. et. al (2013); In this research low cost biomaterial rice husk, saw dust and eucalyptus bark applied as absorbent for the removal of the chromium (Cr). Batch process applied in this research. Eucalyptus bark adsorbs more Cr ion. At different pH, concentration, contact time using rice husk, saw dust and eucalyptus as absorbent. At pH 2 Cr ion adsorb more on these bioadsorbent.

14. Ghanshyam P. et. al (2013); industrial waste released with toxic metal like Hg, Cd, Fe, Cr etc can recover by the adsorption process. In this study Neem leaves used as adsorbent made by the chemical treatment by the phosphoric acid for the activate adsorbent. Activated Neem powder treat for adsorption of heavy metal from waste water with different pH, concentration, adsorbent dose.

15. Ghanshyam P. et. al. (2013); Adsorbent formed from the Neem leaves and activate from the treatment of phosphoric acid then dried in oven for 1h for 20 min. the Neem leave used as adsorbent for the treatment of industrial waste. Neem leaves color removed using methyl red and $K_2Cr_2O_7$.

16. Siti N. et.al. (2013); present study focus on process of adsorption previous studies for adsorption by low cost biomaterial used as alternative to activated carbon. Various adsorbent literature reviewed to make available summary of wide information.


18. Pushpendra K. et. al (2013); Removal of heavy metal by the adsorbent made from byproduct of agro and horticulture such as sugar cane bagasse, rice husk orange peel almond shell, saw dust, soybean null, cotton seed hull, palm pressed null coconut tree sawdust, banana pitch used as adsorbent to remove heavy metal.

19. Burham N. et. al (2014); study revealed that the groundnut shell used as adsorbent by processing esterification with tartaric acid. Physical and chemical character studied by FTIR, Flame atomic adsorption spectrometric (FAAS), Adsorbent effectively remove metals Cd(II), Pb(II), Cu(II) ion with different pH, contact time, adsorption dose.

20. Kavita K. et. al (2014); Study focused on the adsorption of carbon dioxide on the adsorbent orange peel. Effective adsorption of CO$_2$ determines by X-ray fluorescence
spectroscopy and scanning electron microscope and result 2.604m mol/g for 5 gm of orange peel.

21. Liliana B. et al (2014); to enhance adsorption of activated carbon surface area from the use of titanium coated catalyst made by sol-gel method to degradation of NOₓ. compare the adsorption between activated carbon and titanium coated catalyst. Result found that titanium oxide does not enhance area of original activated carbon.

22. Minakshi N. et al (2014); emphasized on the removal of heavy metal released by industries, domestic, agricultural and other sources in the environment removal using adsorbent made by the tea plants water i.e. tea waste. The main aim of indicate feasibility of low cost agro waste material used as adsorbent.

23. Hina C. et al (2014); experiment reveled that removal of lead adsorbed on the surface of the melon peel gel treated from saponification and used as adsorbent. Saponification of melon peel from Ca(OH)₂. Adsorption of lead ion from solution result effectively with high percent at above pH-4. Similarly at pH-3.92 for 10 min. remove 80.13% lead ions. Highest adsorb found when pectic acid with melon peel 12.29% the study revealed that melon on peel change into bioadsorbent for lead followed by saponification

24. Anusha G. et al. (2014); iron removal conducted by the adsorption using almond shell as adsorbent. Almond shell thrown as waste which collected and make shall in size, dried at 170 ° C for 24 h. almond shell as adsorbent adsorb iron in the form of ferrous state. Efficiency of almond shell found to be varying with adsorbent dose time, time and pH, concentration.

25. Prabha R. et al. (2014); Adsorption process done with the use of Rice husk and ground nuts shell for the removal of copper from aqueous solution or polluted water released from agricultural by product. Adsorption made by combining of ground nuts and rice husk experiment result that Ph rised adsorption rises and decrease concentration of metal ion. Contact time 2h and adsorption followed through second order.


27. Thiyakaran S. et. al.(2015); emphasized that heavy metals adsorb by the borassus flabellifer fiber. Study focused on adsorption of zinc ion from waste material of sugar industries effluent and work on parameter pH, initial concentraiton equilibrium time result found 79% heavy metal adsorb on adsorbent dose 6 gm.
28. Ratna A. et. al (2015); Copper ion adsorb on the surface of feathers and chitosan used as adsorbent. Kinetic study show pseudo second order followed by Langmuir and frndlich adsorption isotherm. High percentage of adsorbate forum 93.31% on adsorbent dose 18.78mg/l.

29. Amana D. et. al (2015); present study compare the method developed in past present and future for the adsorption of heavy metal using low cost biomaterial from water which adsorbent cheaper, high effective these trends discussed.

30. Aishatu H. et. al . (2015); In this paper Lonchocarpus laxiflorus leaves used as adsorbent for removal of heavy metal like Fe++, Pb++, Cd++, etc and residual material studied using atomic absorption spectrophotometer (AAS). Capacity of adsorbent done by batch method with parameter pH, contact time, initial time, temperature.

31. Prashant K. et. al (2015); emphasized that many bioadsorbent used for removal of heavy metal. High percentage removal of chromium from the coconut shell adsorbent. Tulsi leaves also used as adsorbent but result fruitless. Adsorption of hexavalent chromium by low cost biomaterial coconut shell powder.


33. Yasmin M. et. al (2015); Adsorbent synthesis using waste material released by agro and horticultural. Nickel ion adsorbed on the biomaterial prepared from the waste material such as coconut husk, tamarind fruit shell, saw dust, oil palm shell. study based on the parameter contact time, adsorbent dose, pH.

34. Sandeep C. (2015); this study revealed that rice husk use for removal of heavy metal. Rice husk as adsorbent ecofriendly, cheap. Adsorption on rice husk mechanism studied by FTIR spectroscopy. Result explain that rice husk have high potential to adsorb heavy like Cu, Ni, Zn, Pb.

35. Sabasri S. et. al (2015); present study deals with removal of heavy metal by activated charchorus olitorius as adsorbent for copper (II ) ion. Data analyzed by Langmuir and frndlich isotherm revealed that large adsorption found at pH 6-7.

36. Nishigandha B. et.al; (2015) Clarified the study of these research that lead (Pb) heavy metal remove from the waste of electrochemical industries by the adsorption using low cost adsorbent. Low cost adsorbent formed by charcoal along with coconut shell carbon and wood charcoal both grinding and chiseling and drying in oven 50°C for 24 h and further treat 4-part of the coconut shell and 3-part concentrated sulphuric acid for 24 h. the result found
that lead remove 19.5 mg/l at pH 5-7. Different amount of adsorbent different efficiency investigated