IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)
An International Open Access, Peer-reviewed, Refereed Journal

"Removal Of Toxic Metals From Agriculture Waste"

1.virend kumar saket 2. Dr Nagmani manikpuri 3. Dr Shikha Saxena 4. Santosh kumar kumhar
1. research scholar, government S.G.S. Collage Sidhi district Sidhi (M.P.)
2. Professor & HOD department of chemistry government N.D. Collage Burhar, district Shahdol (M.P).
3. Professor & HOD Department of chemistry government science collage Jabalpur (M.P.)
4. research scholar Awadhesh Pratap Singh university Rewa (M.P.)

Abstract: - For making India self-reliant in agriculture and energy sector, professor E. Borlaug, awarded the "Nobel peace" prize in the field of agriculture in 1970, and prof. M. S. Swaminathan, awarded the "Bharat ratan" award 2024 of the government of India. In 1968, green revolution was done in wheat crop in three states of Punjab, Haryana and western Uttar Pradesh, due to which the country became self-reliant in "food production" but due to non-utilization of agriculture production products, farmers started burning stubble. The air quality in Delhi deteriorates from. Similarly, in the energy sector, the country will become self-reliant in the energy sector as well, with the professor Hideki Shirakawa "Nobel prize" in chemistry awarded 2019, in the principal of battery manufacture by the government of India under "Pradhan Mantri Surya Uday yojana 2024" energy sector. On the other hand, if no cyclic cause of waste battery, then there can be a large of water pollution. By 2040, a large quantity of discarded batteries will be in direct contact with the environment and various types of toxic metals may cause serious water pollution problems because batteries are manufactured using metals and acids. By studying various research papers, it is possible to removal of toxic metals Fe (III), Pb (II), Cd (II), Cu (II), and Ni (II) from agriculture waste through absorption, technology, models at low cost, India will be self-reliant in food and energy sectors and also environment friendly.

Keyword: - agriculture, energy, product waste, toxic metals,

Introduction

India is a developing country in which industrial development is also increasing rapidly due to increasing, the country is progressing in various fields such as electro plastics, dry batteries, varnish paints, solar cells, so that India can become a self-reliant country. Batteries currently available on commercial scale are generally used in two types of battery. The first battery is used once then dismantled and the second rechargeable battery. Disposable batteries are a serious threat to the environment because they are expensive to be recycled all the time. In addition, they are not suitable for electric vehicles due to their one-time use. There are different types of rechargeable batteries are lead-acid, sodium-sulfuric, nickel-cadmium, nickel-metal hydride and lithium-ion, etc. nickel-cadmium is the most promising battery technology that is being used commercially in electric vehicle due to its high energy density and low self-discharge rate [1]. In today's changing times such as smartphones, tablets, portable computers, electric vehicle, the use of alloys iron and copper has increased rapidly. Excellent electrical and mechanical properties are also required to suit a variety of applications. To meet these requirements, Cu (II) alloys with exceptional electrical, thermal, and mechanical properties by adding small alloying elements Cu (II) & Fe alloys have positive mixing enthalpy but metastable mixability gape exist resulting from liquid-phase separation between Cu (II) & alloys electromagnetic or electric device [2]. Industrial development in India is causing mercury to flow into the environmental in toxic including lead, zinc, copper, nickel and cadmium. As a cost-effective alternative to traditional waste treatment methods, bio-exploitation technology uses natural and agricultural waste materials as absorbents, which are relatively cheap, durable and abundant. This study focuses on the ability of rice husk and sugarcane bagasse in removing toxic metals from wastewater. Adsorption tests for different combination of rice-husk and sugarcane bagasse have been carried out for different dosage, contact time, Ph and mixing speed optimum levels resulting in maximum removal efficiency level being ascertained. To determine the efficiency of the adsorbents, the Redlich-Petersen isotherm was manufactured using under different condition [3]. Adsorption equilibrium analysis the isotherm models of Freundlich-Langmuir the feasibility of using lingo-cellulosic agriculture waste material for removal of Cd (II) & Ni (II) from wastewater has been studied. For this archive hypogea shells in natural as well as stable from batch of beads has been studied in the effect of various process parameters, namely Ph, absorbent dose, initial metal ion concentration, stirring speed time. the maximum removal efficiency for Ni (II) & Cd (II) is found at Ph 6.0 [4]. these two-adsorbent data with the previously mentioned and adsorbent obtained from agriculture and industrial waste product, organic, inorganic materials and bio adsorbent, have been done with the help of adsorbent data Langmuir and Freundlich adsorption model technique the value of maximum monolayer adsorption capacity is 154.3 mg/l for adsorbent rice husk [5]. Various adsorbent with maximum adsorbent capacity has been used to remove toxic metals commonly found in water. Currently, research work is available on the use of various adsorbent for the removal of commonly found toxic metals. The best and most efficient adsorbent for special metal removal. Using dried hyacinth stems and leaves helps removal Pb (II) Cu (II) & Ni (II) using sugar bagasse.[6]. the development of India depends on industrial, agriculture and technical metals their compounds. Simultaneously, due to advancement in contemporary science and technology metals are increasingly being industry. One of the toxic metals that is often found in industrial wastewater is lead, terrestrial life its release into the environment poses a serious threat. Lead is a dangerous pollutant that has negative effects, toxic effect on the health of animals and plants. The research uses carbon and potassium hydroxide made from coconut peel for adsorption activation of Pb (II). the initial Pb (II) Concentration adsorption used for research was 15-40 mg/l the temperature was 20–60-degree celosias [7]. Adsorption of Pb (II) from aqueous solution on rice husk and its ash for removal of heavy metal ions from waste water. Rice husk is a by-product of agriculture. Rice husk ash is a solid substance obtained after burning rice husk. pH, appropriate equilibration time, amount of adsorbent, concentration of adsorbent and particle size. Pb (II) removal results in increased removal efficiency with increasing solution ph. The maximum adsorption of 86.74% was achieved at pH 4.5 ± 0.4, contact time 06 hours at a concentration of 30 mg/L-1. Langmuir, Freundlich and Dubinin-Radash Kevich Adsorption Isotherm Model Absorption has been used. [8], [9], [10].

Relevant literature: -

Used as natural adsorbent for removal of Cu (II), Fe (II) and Pb (II) from coconut husk the effect of different adsorbent loading, Ph, contact time, metal ion concentration and temperature on Cu (II) and Fe (III) of industrial waste stream while Langmuir isotherm was determined for the adsorption of Pb (II) [11]. The explicit Nernst–Planck approximation is used to study the kinetics of ion-exchange processes for ions with different effective diffusion coefficients, The kinetic study of heavy metal ions of environmental importance Cd (II), Cu (II), and Pb (II) on the surface of acetonitrile stannic (IV) selenite composite cation exchanger was carried out. Mechanism of ion exchange on the surface of composite ion-exchange materials the activation entropy and energy revealed that more degree and minimum energy was achieved during the further ion-exchange process.[12]. The effect of pH, temperature, contact time, metal ion concentration and adsorbent loading on the adsorption process for removing Pb (II), Zn (II) and Cd (II) from aqueous solution using activated carbon was investigated. Temperature, adsorbent loading, initial metal ion concentration and the amount of adsorbed metal ion increased with increasing contact time. Equilibrium isotherms were analysed by Langmuir and Freundlich adsorption isotherm models and Pb (II) adsorption from adsorption equilibrium data was obtained in Langmuir model, while Zn (II) and Cd (II) got better result in Freundlich adsorption model [13]. According to the united nation world water day report 2020, supplying clean water and food to the citizens is a challenging topic for scientist, in which the pollution of water due to agriculture production for food supply and increasing urbanization should control both [14]. peanut husk is used to remove toxic metals from industrial waste water in which like Fe, Cu, Cd, Pb, and Ni easily removed up to 90% to 95% [15]. the process of adsorption in lead and cadmium toxic metals from agriculture waste sugarcane husk can be easily separated from the biomass. The process of adsorbent of metals from battery waste at low concentration followed the Langmuir isotherm model with uniform distribution of metals ions on the surface of the biomass [16]. Investigation of biosorption characteristics of Pb (II) and Cd (II) ions from aqueous solution using green (Ulva lactuca) biomass depending on Ph, biomass dosage, U. Langmuir Freundlich and Dubinin-Radushkevich models ware applied to describe the biosorption isotherm of metals ions by lactuca biomass [17]. the Duval models on heating rice husk with an aqueous solution of activated carbon containing Cuper cadmium to an ideal Ph for about 2 hours. XRD, Raman spectra, body models simulation results of cadmium adsorption transfer process. Maximum adsorption capacity 62.10mg/l [18]. Aqueous solution activated carbon prepared by burning agriculture waste materials from coir pith by chemical activation method for adsorption of toxic metals, Fe (III), Pb (II) Cu (II) and Ni (II) the use of has been studied synthetic solution. The need of the hour is to utilize adsorption of metals on coir carbon from industrial waste water in the present work. Since coir is discarded as waste from coir processing industries, the resulting carbon is expected to be an economical product for removing toxic from industrial waste water [19]. the biosorption of toxic metals Ni (II) and Cd (II) Using chemically modified orange peel cellulose adsorption was investigated. Initial Ph, concentration of metals ions, biosorption equilibrium in about one hour. The rapidly established Langmuir and Freundlich adsorption isotherm modal the experiment data for all toxic metals. [20]

Experiment method

Langmuir isotherm

the Langmuir isotherm was initially development for gas-solid interaction but is also used for various adsorbents. It is an empirical model based on kinetic principal the surface rates of equilibrium condition following assumption monolayer adsorption, homogeneous sites, constant adsorption energy, and no lateral interaction between the adsorption isotherm can be written as

$$q_e = \frac{q_0 k_L C_e}{1+k_L Ce} \qquad (18)$$

Where q_o is maximum amount of adsorbent surfactant in L/mg and K_L is Langmuir constant in L/mg. the linearized version of equation

$$\frac{C_e}{qe} = \frac{1}{k_{L\,qo}} + \frac{Ce}{qo} \qquad (19)$$

Mathematically, it can be show as.

Freundlich isotherm.

Unlike the Langmuir isotherm, this empirical can be used for multilayer adsorption on heterogeneous sites. it assumes the adsorption heat distribution and affinities toward the heterogenous surface are non-uniform the mathematical equation

$$qe = bc_e\frac{1}{n} \qquad (21)$$

Where b is the adsorption capacity in L/mg and 1/n is the adsorption intensity or surface heterogeneity. The linearized from can be shows

$$1nqe = ln\,b + \frac{1}{n}ce \qquad (22)$$

Stability for constant metal-ligand complex

	CO_3^{2-}		SO_4^{2-}		NH_3		HS^-		Cl^-		F-	
Fe^{2+}	Fe^+	10.42	Fe	2.41	Fe^{2+}	1.41	Fe	6.51	Fe^{2+}	1.51	Fe^{2+}	6.12
Cu^{2+}	Cu^+	11.91	Cu^0	2.31	Cu^{2+}	4.12	Cu^-	24.76	Cu^+	0.41	Cu^+	1.80
Pb^{2+}	Pb^+ Pb^{2-}	14.20 9.8	Pb^0	3.41	Pb^+		Pb^0	16.31	Pb^+	1.62	Pb^+	2.31
Cd^{2+}	Cd^+ Cd^{2-}	11.8 7.2	Cd^0	2.36	Cd^{2+}	2.62	Cd^+	7.91	Cd^+	2.01	Cd^+	1.30
Ni^{2+}	Ni+	12.91	Ni^0	2.31	Ni^{2+}	2.61	Ni^+	5.61	Ni^+	-0.41	Ni^+	1.21

Redox half reaction

Reaction	E^0 (V)	P	P	Log K
$Fe^{3+} + e^- = Fe^{2+}$ $Fe^{2+} + 2e^- = Fe^0$ (s)	0.769 -0.441	13.03 -7.45	13.03 -7.45	13.03 -14.90
$Pb^{4+} + 2e^- = Pb^{2+}$ $Pb^{2+} + 2e^- = Pb^0$ (s)	0.845 -0.126	14.32 -2.13	14.32 -2.13	28.64- 4.27
$Cu^{2+} + e^- = Cu^+$ Cu^{2+} 2e = Cu^0 (s)	0.160 0.339	2.72 5.74	2.72 5.74	2.72 11.48
$Ni^{2+} + 2e^- = Ni^0$	-0.236	-3.99	-3.99	-7.98

Result and discussion

N The way the country is developing electric batteries in the field of energy, it affects every aspect of life. Due to this, when the battery gets damaged at a certain time, it becomes waste in the form of mobiles, two-wheelers, computers, etc. Many of the metals used in making batteries used in large vehicles, solar panels etc. are also dangerous toxins. Pollutes the environment, fauna and flora, ground water and causes health problems. Metals released from industries contain large amounts of toxic metals. Similarly, agricultural production is also done in large quantities in India. Agriculture also produces residual material which the farmers burn the unused stubble due to which air pollution spreads in Delhi, Punjab, Haryana and Western Uttar Pradesh. The waste has to be utilized for the development of energy and agriculture for the environment. Toxic metals like Fe (II), Cu (II), Pb (II), Cd (II) & Ni (II) are extracted in different forms from agricultural products like Rice husk, sugarcane bagasse, coconut peel, urad peel etc. The organic matter is separated using inorganic techniques, pH concentration, temperature time.

Agriculture waste	Fe (II)	Cu (II)	Ni (II)	Hg (II)	Pb (II)	Cd (II)	References
Rice husk & sugarcanes bagasse solution		85.5 94.2	92.3 87	58.1 61.1	57.8 66.5	66.2 71.5	[15]
Fly ash solution		78.4	67.5	55	51	65	[15]

References

1. P. kumar, S. Bansal, A. Sonthaliya, handbook of thermal management system E-Mobility and other energy applications 2023, pages 95-118.
2. Y. B. Jeong, H. R. Jo, H. Kato, K.B. Kim, Journal of martials research technology volume 9, issue 6, November-December 2020, pages 15989-15995.
3. R.L. Naik, M. R. Kumar, T. B. Narsaih material study proceeding volume 72, 2023, pages 92-98.
4. G. Mahajan, D. Sud journal of environment chemical engineering volume 1, issue 4, December 2013, pages 1020-1027.
5. P. Sharma, R. Kour, C. Baskar, Wook-Jin C. Desalination volume 259, issue 1-3, 15 September 2010, pages 249- 250
6. A. Kaur and S. Sharma, Indian journal of science and technology, September 2017,
7. volume 10 (34).
8. Dr. A. Madhu, S. Jyothirmai, B. Naresh, B. Prashanth, 2019 IJCRT, Volume 7, issue 1 January 2019.
9. A. G. El-Said Journal of American science 2010, volume 6, pages 10.
10. H. A. Dessouki & S. S. Ibrahiem, the Malaysian journal of analytical science, volume 15 No 1 2011, pages 8-21.

11. K. Y. Foo, & B. H. Hameed, Advances in colloid and interface science, volume 152, issues1-2, November 2009, pages 39-47.
12. Oyedeji O. A. & osinfad G. B. African journal of environmental science and technology volume 4 (6) pp. 382-387, Jun 2010
13. A. Mittal and V. Gupta desalination and water treatment volume 54, 2015, issue 10.
14. P.M. Ejikeme & J. C. igwe, Asian journal of chemistry, volume 28, no 10 (2016) 2131-2138.
15.
16. United nation world water development report online www.unwater.org 2020.
17. I. Abdelfattah, A. A. Ismail, F. A. Sayed, K. M. Abeolghatait, environment nanotechnology, monitoring and management volume 6, December 2016, pages 176-183.
18. M. Basu, A. A. Guha, L litagauri ray process safety and environmental protection volume 106, February 2017, pages 11-22.
19. A. Sari, Mustafa journal of hazardous material volume 152, 21 march 2008, pages 302-308.
20. X. Jhang, S. Wu, Y. Liu etc. carbon resource conversion, volume 6, issue 2, Jun 2023, pages 76-84.
21. K. Kadirvelu, K. Thamaraiveliue, C. Namasivayam bioresource technology, volume 76, issue 1 January 2001, pages 63-65.
22. Xiaomini li, Y. Tang, dandan lu, F. Luo colloid and surfaces a physicochemical engineering aspect, volume 317, issue 1-3, march 2008, pages 512-521.
23. K. Rana, M. Shah, N. Limbachiya, international journal of advanced engineering research and science (IJAERS) [Vol-1, issue-1, June 2014