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Use of Low Cost Adsorbents for the Adsorption of Heavy Metals from Waste Water: A Review

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Abstract: *This review is exploring the possibilities of removing Heavy Metal ions using several low-cost adsorbents from water and wastewater. In the past, several traditional methods like precipitation, evaporation, electroplating and ion exchange were employed for removing Heavy Metal ions. These processes were associated with various limitations. The process using low-cost adsorbents can be considered as an eco-friendly process. Large amount of natural and agricultural waste are available in the environment which can be used in the process of adsorption. Adsorption is a one of the effective method for removal of heavy metals. Based on the superior characteristics, such as cost-effectiveness, effective removal of heavy meals, and availability, the adsorption is definitely an efficient for removing Heavy Metal ions from water and waste water. This review provides a brief consideration of the relevant literature which exists on the low-cost adsorption for removing various heavy metal ions from polluted water and wastewaters. In order to understand the overall adsorption process of low-cost adsorbents, this review also includes the various existing adsorption models like adsorption isotherm along with the impact of various factors like contact time, temperature, pH on the process of adsorption.*

Keywords: Adsorption, Adsorption Isotherm, Heavy Metal ions, Low-cost adsorbent

REFERENCES

[1]. Cheremisinoff P.N. and Morresi A.C (1978). Carbon adsorption Handbook. Borought Green: An Arbor Science Publishers.
[2]. Rahmani, K., Mahvi A.H., Vaezi F., Mesdaghinia A.R, Nabizade R., Nazmara S. (2009).
[3]. Bioremoval of lead by use of waste activated sludge. International Journal of Environmental Research, , 3 (3), 471-476.
[4]. Shah B.A., Shah A.V. and Singh R.R., (2009). Sorption Isotherm and Kinetics of Chromium Uptake from Wastewater using natural sorbent material. International Journal of Environmental Science and Technology , 6 (1), 77-90.
[5]. Meunier N., Laroulandie J., Blais J.F. and Tyagi R.D. (2003). Cocoa shells for heavy metal removal from acidic solutions. Bioresource Technology, , 90 (3), 255- 263.
[6]. Ajmal, M., Rao A.K., Anwar J.A. and Ahmad R. (2003). Adsorption studies on rice husk: Removal recovery of Cd (II) from wastewater. Bioresource Technology , 86, 147-149.
[7]. Bulut Y. and Tez Z. (2003). Removal of heavy metal ions by modified sawdust of walnut. Fresenius Environmental Bulletin , 12 (12), 1499-1504.
[8]. Saeed A., Akhter M. W. and Iqbal M. (2005). Removal and recovery of heavy metals from aqueous solution using papaya wood as a new biosorbent. Separation and Purification Technology (45), 25-31.
[9]. Babarinde N.A., Babalola J. and Adebowale R. (2006). Biosorption of lead ions from aqueous solution by maize leaf. International Journal of Physical Sciences., 1, 23-26.
[10]. Bhattacharya A.K., Mandal S.N. and Das S.K. (2006). Adsorption of Zn(II) from aqueous solution by using different adsorbents. Chemical Engineering Journal, 123, 43-51.
[11]. Nascimento M., Soares P.S.M. and Souza V.P.D. (2009). Adsorption of heavy metal cations using coal fly ash modified by hydrothermal method. Fuel , 88 (9), 1714-1719.

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[12]. Cay S., Uyanik A. and Ozasik A. (2004). Single and binary component adsorption on copper (II) and cadmium (II) from aqueous solution using tea industry waste. Separation and Purification technology , 38, 273-280.

[13]. Sathiya E., Srinivasan K. (2009). Bimetal Adsorption by Cottonseed Carbon. E-Journal of Chemistry , 6 (4), 1167-1175.

[14]. Aliabadi M, Moussavi S, et. al (2012). Detoxification of chromium(VI) contaminated water using natural adsorbents. International Journal of Biosciences (IJB) , 2 (10(2)), 89-94.

[15]. Jayajothi C, Sethamilselvi M.M, Arivoli S, Muruganantham N. (2017). Kinetics of Batch Adsorptionof Iron(II) ions from Aqueous Solution using Activated Carbon from Glossocardia Linearifolia stem. international journal of Research in chemistry and environment , 7 (3), 9-17.

[16]. Azad A. K. (2014). Removal of iron from aqueous solution using Maize corncob as adsorbent. International Journal of Chemical Sciences and Applications , 5 (3), 122- 125.

[17]. Srivastava R. K, Ayachi A. K, S ehgal Vandana (2005) "The cleanup of cadmium rich effluents by saw dust" Indian Journal of Environ Sci. 9(1&2), 9-14

[18]. Revathi M, Kavitha B, Vasudeval T (2005) "Removal of nickel ions from industrial plating effluents using activated alumina as adsorbent." Journal of Environ Sci. Engng. 47(1), 1-6

[19]. Ansari R and Omidvari R, (2005), "Adsorption of Hg^{2+} ion from aqueous solution using activated carbon polish". Journal of Environmental studies 14(2), 191-194

[20]. Desai B, Desai H, (2013), "Potential of Moringa Oleifera (drum sticks) Seeds and its Application as Natural Adsorbent in Removal of Heavy Metal Ions", International Journal of Environment, Ecology, Familyand Urban Studies (IJEEFUS), 3 (4) 9-22

[21]. K.S. Beenakumari, (2009), "Removal of Iron from Water Using Modified Coconut Shell Charcoal as Adsorbent", Curr. World Environ., 4(2), 321-326

[22]. Hussain A.A., Mohammed S.R., Nallu M, Arivoli S(2012), "Adsorption of Fe(III) from aqueous solution by acanthaceae activated carbon" J. Chem. Pharm. Res. 4(4), 2325-2336

[23]. H. Panda, N. Tiadi, M. Mohanty, C.R. Mohanty (June 2017), "Studies on adsorption behavior of an industrial waste for removal of chromium from aqueous solution." South African Journal of Chemical Engineering 23 132-138.

[24]. Fatemeh Gorzin, MM Bahri Rasht Abadi (2017) "Adsorption of Cr(VI) from aqueous solution by adsorbent prepared from paper mill sludge: Kinetics and thermodynamics studies." Adsorption Science & Technology, 1-21.

[25]. Alghamdi AA, Al-Odayni AB, Saeed WS, Al-Kahtani A, Alharthi FA, Aouak T (2019 Jun) "Efficient Adsorption of Lead (II) from Aqueous Phase Solutions Using Polypyrrole-Based Activated Carbon." Materials (Basel) 12(22)

[26]. Milton Manyangadze, Nyaradzai M.H. Chikuruwo , T. Bala Narsaiah,. (2020) "Adsorption of lead ions from wastewater using nano silica spheres synthesized on calcium carbonate templates." Heliyon 6 1-13.

[27]. Aamna Ashfaq, Razyia Nadeem , Shamsa Bibi, Umer Rashid Umer Rashid. "Efficient Adsorption of Lead Ions from Synthetic Wastewater Using Agrowaste-Based Mixed Biomass (Potato Peels and Banana Peels)." Water 13, no. 3344 (2021, 13, 3344): 1-15.

[28]. Yali Wang, Huining Li, Suping Cui, and Qi Wei. (2021) "Adsorption Behavior of Lead Ions from Wastewater on Pristine and Aminopropyl-Modified Blast Furnace Slag." Water, no. 13 1-19.

[29]. Paul J. M., Vijayan A. M., Raju A., Megha C.S., Sadique K. (2016). Comparison of Iron Removal Effeciency by Areation and Adsorption. IOSR Journal of Mechanical and Civil Engineering , 13 (3), 01-04.

[30]. Balaji R., Sasikala S., Muthuraman G. (2014). Removal of Iron from drinking / ground water by using agricultural Waste as Natural adsorbents. (IJEIT), International Journal of Engineering and Innovative Technology , 3 (12), 43-46.

[31]. Tan W. T., Ooi S. T., Lee C. K. (1992). Removal of chromium (VI) from solution by coconut husk and palm pressed fibers. Environ. Technol. , 14 (3), 277–282.

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[32]. Sumathi T., & Alagumuthu G. (2014). Adsorption Studies for Arsenic Removal Using Activated Moringa oleifera. International Journal of Chemical Engineering, 2014, 1-6.

[33]. Amuda O.S., Ibrahim A.O. (2006). Industrial wastewater treatment using natural material as adsorbent. African Journal of Biotechnology , 5 (16), 1483-1487.

[34]. Mohammed Jaafar Ali Alatabe, Ahmed Alaa Hussein. (2021) "Review Paper. Utilization of Low-Cost Adsorbents for the Adsorption Process of Chromium ions." 2nd International Scientific Conference of Engineering Sciences (ISCES 2020). IOP Conference Series: Materials Science and Engineering,.

[35]. Hanumantharao Y., Kishore M., & Ravindhranath K. (2011). Preparation and development of adsorbent carbon from Acacia farnesiana for defluoridation. International Journal of Plant, Animal and Environmental Sciences , 1 (3), 209-223.

[36]. Gulipalli C. S., Prasad B., Wasewar K. L. (2011). Batch Study, Equilibirum and Kinetics of Adsorption of Selenium Using Rice Husk Ash (RHA). Journal of Engineering Science and Technology , 6 (5), 586 – 605.