A REVIEW PAPER ON WATER TREATEMENT

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ABSTRACT

Efficient waste water treatment is a key prerequisite for a growing economy during a time of water constraints. It is necessary to develop and execute novel waste treatment technologies with high efficiency and minimal cost. Recent advanced processes in the sciences of nano-materials drew several remedies from scientists. However, limited community information is available in this setting. The present essay analyses potential advances in nanotechnology in wastewater treatment. The research assessed and analysed the application of many kinds of nano-materials for wastewater treatment. This includes four main categories. Nano adsorbents such as carbon, carbon nanotubes, grapheme, manganese oxide, zinc oxide, titanium oxide, magnesium oxide and ferric oxides are first and foremost extensively used for heavy metal extraction. This includes four fundamental categories. Secondly, nano-catalysts including photocatalyst, electric catalyst, Fenton-based catalyst and chemical oxidizer have showed promise for the elimination of organic and inorganic contaminants. Thirdly, nano-membrane was employed for effective dyes, heavy metals and foulant removal, which included carbon nanotube membrane, electrospun nano-fibers and hybrid nanomembrane. In conclusion, nanotechnology integration is explored with respect to wastewater potential, using bioreactive algal membrane, anaerobic digestion and microbial fuel cell.

KEYWORDS: Water Treatment, Water Constraints. Nanomembrane

INTRODUCTION

Water on Earth is one of the richest natural resources, although only around 1% of water is humanly available. It is estimated that more than 1,1 billion people are inadequately supplied with water (WHO, 2015) because of increasing water costs, increasing populations and a host of environmental and climatic concerns. A continuous water pollution with many organic and inorganic pollutants is the major problem in the water system. The treatment of waste water and drinking water may lessen such problems , however standard process treatment processes are not sufficient to fully eradicate new contaminants and meet strict water quality criteria . In addition, existing waste water treatment systems have severe shortcomings, such as excessive energy consumption, poor waste disposal and the creation of dangerous wastewater. Biological waste water treatment is widespread and slow, limited due to the presence of non-biodegradable con- taminants and occasionally dangerous to micro-organisms due to toxic chemicals.

Physical operations like filtering may remove contaminants, shift them from phase to stage and generate highly concentrated sludge which is dangerous and hard to disposal. The above situation calls for the efficiency and efficiency of municipal and urban treatment technologies industrial waste water industrial waste water industrial waste water industrial wastewater. Either the development of wholly new processes or the refinement of established methods via particular interventions may do so. Among the many developed technologies, nanotechnological advances have proven an incredible promise for waste management and numerous other environmental concerns.

NANOSCIENCE AND WATER TREATEMENT

Nanoscience is a field of nanotechnology, a tiny phenomenon. Nano-materials are the smallest human constructions of a few nanometers. More precisely, nano-particles include structural components with a single size at least below 100 nm. Nano-materials have been generated in different forms as nano-fires, nano-tubes, films, particles and colloids. In waste water applications, many efficient, ecologically friendly and affordable nano-materials with unique functionality have been created for possible decontamination of wastewater, surface water, water and drinkable water. Nanotechnology has been recognised as one of the most advanced wastewater treatment methods in numerous literatures. It may be divided into three broad divisions based on the type of nano-material: nano-adsorbents, nano-catalysts and nano-membrane. Nano-adsorption technology has lately developed many and successful projects to explore pollutant removal.

WATER WASTE MATERIAL

Nano-adsorbent waste water materials Nanoadsorbent may generate the atoms of elements that are chemically active and highly adsorbent on the nano-material surface. The nano-adsorbents are used in the manufacturing in the form of composites of activated vehicles, silica, clay, metal oxides and compounds. The second class of nanomaterials is nano-catalysts. Nano-materials such as metal oxides and semiconductors for the development of waste water treatment systems were the subject of the scientist's attention. For example, electrocatalysts, fenton based catalysts are employed in the degradation of water contaminants and to enhance organic oxidation and antimicrobial catalysts. The third form of nano-membrane used in wastewater treatment is nano-membrane. The safe driven water treatment was suitable for improving the required water quality in this technology. Nanofiltration (NW), owing to small pores, inexpensive cost, high efficiency and ease of use, are frequently utilised in wastewater processing industries among other kinds of membrane filtration. For example, nanosubstances such as nano-metal particles, nano-carbon tubes and non-metal particles may be created from nanosubstances. A large number of research projects have been examined to emphasise the effectiveness of numerous nano-materials recently developed. In this work, four basic types of nano-materials were explored in wastewater treatment. Nanoadsorbents, nano-catalysts, nano-membranes and integration of biological techniques in nanotechnology are covered.

CONCLUSION

In recent years, the possibilities of nano-particle materials as adsorbents have been investigated. The smaller nano-particle dimensions increase the surface area, which enhances chemical operations and the adsorption capacity of nano-particles for metals on the surface . Adsorption depends on adsorbent coefficient Kd and the recitation partition – for pollutants such as heavy metals or organic pollutants under balancing conditions. The redox reaction also encourages ion structural changes for persistent inorganic pollutants. However, numerous studies strongly agree that the toxicity of these pollutants is affected by redox changes. The most commonly used nano-particles include acti-vate carbon and nanotubes, manganese oxide, grapheme, zinc oxides, magnesium oxides, titanium oxide and ferric oxides. There are two primary features of nano-adsorbents: intrinsic and alien functioning. Their physical, chemical and material features also concern the outward surface structure, apparent dimensions and composition (Mirkin et al., 1996). The adsorption processes in an aquatic environment are affected by: large surface area, adsorption, chemical activity, atom surface location, lack of resistance to internal diffusion and high surface energy binding. The capacity to adsorb contaminants at low concentrations (ppb), absorbed pollutants readily removable from the adsorbent area and repeatedly recycled should be employed for removal of heavy metals.

REFERENCES

1. Al-Ghobari, H. M., Mohammad, F. S., El Marazky, M. S. A., & Dewidar, A. Z. (2017). Automated irrigation systems for wheat and tomato crops in arid regions. *Water SA*, *43*(2), 354–364. https://doi.org/10.4314/wsa.v43i2.18

2. Alarcón, A. L., Cánovas, M., Senn, R., & Correia, R. (2005). The safety of thiamethoxam to pollinating bumble bees (Bombus terrestris L.) when applied to tomato plants through drip irrigation. *Communications in Agricultural and Applied Biological Sciences*, *70*(4), 569–579. https://www.scopus.com/inward/record.uri?eid=2-s2.0-33745798661&partnerID=40&md5=d8a930dc5880ca2de44efbbf6727867e

3. Chang, C.-C., Huang, M., DiGiovanni, K., Yang, X., Peng, Y., & Zhao, W. (2014). Sustainability. *Water Environment Research*, *86*(10), 1354–1386. https://doi.org/10.2175/106143014X14031280667895

4. Dennett, J. A., Bernhardt, J. L., & Meisch, M. V. (2003). Effects of fipronil and lambda-cyhalothrin against larval Anopheles quadrimaculatus and nontarget aquatic mosquito predators in Arkansas small rice plots. *Journal of the American Mosquito Control Association*, *19*(2), 172–174. https://www.scopus.com/inward/record.uri?eid=2-s2.0-0038481644&partnerID=40&md5=ac962a53382299118a26365c63bc6140

5. Herrick, T., Harner-Jay, C., Shaffer, C., Zwisler, G., Digre, P., & Batson, A. (2017). Modeling the potential impact of emerging innovations on achievement of Sustainable Development Goals related to maternal, newborn, and child health. *Cost Effectiveness and Resource Allocation*, *15*(1). https://doi.org/10.1186/s12962-017-0074-7

6. Karamouz, M., Zahraie, B., Torabi, S., & Shahsavarie, M. (1999). Integrated water resources planning and management for Tehran metropolitan area in Iran. *WRPMD 1999: Preparing for the 21st Century*. https://doi.org/10.1061/40430(1999)96

7. Kumar, D. (2005). Status and direction of arid legumes research in India. *Indian Journal of Agricultural Sciences*, *75*(7), 375–391. https://www.scopus.com/inward/record.uri?eid=2-s2.0-33644624575&partnerID=40&md5=37fa41a85a9178332e5edfc95277a2aa

8. Kumar, L. V. (2008). Urban infrastructure and water resources. *Water and Energy International*, *65*(3), 77–80. https://www.scopus.com/inward/record.uri?eid=2-s2.0-58249093447&partnerID=40&md5=dfe453d32ef2a6b3441adc3dc484e991

9. Levy Jr., R. J., Bond, J. A., Webster, E. P., Griffin, J. L., & Linscombe, S. D. (2006). Effect of cultural practices on weed control and crop response in imidazolinone-tolerant rice. *Weed Technology*, *20*(1), 249–254. https://doi.org/10.1614/WT-05-099R.1

10. Otterpohl, R., Albold, A., & Oldenburg, M. (1999). Source control in urban sanitation and waste management: Ten systems with reuse of resources. *Water Science and Technology*, *39*(5), 153–160. https://doi.org/10.1016/S0273-1223(99)00097-9

11. Schertenleib, R. (2005). From conventional to advanced environmental sanitation. *Water Science and Technology*, *51*(10), 7–14. https://doi.org/10.2166/wst.2005.0345

12. Shin, Y. H., & Schideman, L. C. (2015). Characterizing the fate and transport of Chemicals of Emerging Concerns (CECs) from integrated bioenergy and manure management system. *American Society of Agricultural and Biological Engineers Annual International Meeting 2015*, *4*, 3050–3057. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84951985121&partnerID=40&md5=dbda6afb92081fa3ed5f8f761f1e626f

13. Waheed, T., Bonnell, R. B., Prasher, S. O., & Paulet, E. (2006). Measuring performance in precision agriculture: CART-A decision tree approach. *Agricultural Water Management*, *84*(1–2), 173–185. https://doi.org/10.1016/j.agwat.2005.12.003

14. Yadav, S. (2018) "Growing Human Population and Sustainable Development", IARS' International Research Journal. Vic. Australia, 8(1). doi: 10.51611/iars.irj.v8i1.2018.87.

15. Woods, G. J., Kang, D., Quintanar, D. R., Curley, E. F., Davis, S. E., Lansey, K. E., & Arnold, R. G. (2013). Centralized versus decentralized wastewater reclamation in the houghton area of Tucson, Arizona. *Journal of Water Resources Planning and Management*, *139*(3), 313–324. https://doi.org/10.1061/(ASCE)WR.1943-5452.0000249

16. Zamora-Thompson, X., Bielefeldt, A. R., & Kreider, J. F. (2005). Integrating renewable energy in water systems: Design case studies for the Galápagos islands. *Proceedings of the Solar World Congress 2005: Bringing Water to the World, Including Proceedings of 34th ASES Annual Conference and Proceedings of 30th National Passive Solar Conference*, *4*, 2880–2885. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84870535421&partnerID=40&md5=032876c35038af72cd5c5b6d676a280f