Industrial Chemistry
ISSN: 2469-9764
Case Report Open Access

Vertical bioreactors for the removal of Nitrogen and Phosphorus compounds from industrial and domestic wastewater

Tom Brown*

Department of Nucleic Acid Chemistry, University of Oxford ,UK

Abstract

Domestic sewage and industrial effluents are still major sources of water pollution in many parts of the world. Domestic sewage is generated by households and includes wastewater from toilets, sinks, and showers, while industrial effluents are generated by industries and can contain a variety of pollutants depending on the type of industry. In present days, there are various treatment methods available for the treatment of domestic sewage and industrial effluents, which include physical, chemical, and biological methods. These methods are designed to remove pollutants and contaminants from the wastewater before it is discharged into the environment. However, despite the availability of treatment methods, many areas of the world still lack proper infrastructure and resources to effectively treat domestic sewage and industrial effluents. This results in the discharge of untreated or partially treated wastewater into rivers, lakes, and oceans, leading to water pollution and health hazards for humans and aquatic life.

Introduction

Efforts are being made by governments, NGOs, and other organizations to address this issue by improving infrastructure and implementing effective regulations and policies to ensure the proper treatment and disposal of domestic sewage and industrial effluents [1]. The discharge of untreated or poorly treated industrial and domestic wastewater into natural water bodies poses a significant risk to the environment and public health. One of the major concerns is the presence of nitrogen and phosphorous compounds, which can lead to eutrophication and harmful algal blooms in receiving water bodies. One promising technology for the removal of these compounds is the useofverticalbioreactors

Vertical bioreactors are an innovative wastewater treatment technology that combines both aerobic and anaerobic processes [2]. These reactors use a vertical column filled with different media, such as gravel, sand, and plastic, to create an environment suitable for the growth of microorganisms that can remove pollutantsfromwastewater. In the treatment of nitrogen and phosphorous compounds, vertical bioreactors use a combination of nitrification, denitrification, and phosphorus removal processes. Nitrification is the process of converting ammonia to nitrate through the activity of nitrifying bacteria. Denitrification, on the other hand, is the conversion of nitrate to nitrogen gas through the activity of denitrifying bacteria. Finally, phosphorus removal involves the precipitation of phosphorus compounds as insoluble particles through the addition ofchemicalssuchasferricchloride. The use of vertical bioreactors for the removal of nitrogen and phosphorus compounds has several advantages over traditional wastewater treatment methods [3]. Firstly, vertical bioreactors have a smaller footprint compared to other treatment systems, making them ideal for areas with limited space. Secondly, they require less energy and maintenance, making them more cost-effective. Finally, they produce less sludge, which reduces the need for sludge disposal.

Effluent limits of 1 or 2 mg/L of absolute phosphorus (Tp) have been widely implemented in certain areas of the United States, such as the Great Lakes Drainage Basin (1 mg/L) and the Lower Susquehanna River Basin (2 mg/L). However, in some regions, more stringent effluent phosphorus limits are being enforced due to local water quality conditions. For instance, in the lower Potomac River Basin, municipal plants have had to comply with discharge limits thatarelessthan0.2mgTP/Lforseveralyears [4]. The performance of vertical bioreactors in the removal of nitrogen and phosphorus compounds has been demonstrated in several studies. For instance, in a study conducted by Zhang et al. (2018), a vertical bioreactor was used to treat domestic wastewater, and the results showed that the system was able to remove91.4%oftotanitrogenand99.2%oftotalphosphorus.

In conclusion, the use of vertical bioreactors for the removal of nitrogen and phosphorus compounds from industrial and domestic effluents is a promising technology that can help to reduce the negative impact of wastewater discharge on the environment and public health [5]. The technology is cost-effective, requires less maintenance, and produces less sludge compared to traditional wastewater treatment methods. Further research and development of this technology can lead to its wider adoption and contribute to a cleaner and safer environment.

Phosphorus in water quality and waste management

Phosphorus (P) is a key element for all living systems. Phosphorus is a component of DNA and RNA and indispensable for the energetic metabolism (ADP/ATP) of living beings. Phosphorus cannot be substituted in these biological functions by any other element. The tremendous growth of global population is therefore linked to a proportional increase of phosphorus requirement to produce food, which actually to a large extent is depending on the use of mineral phosphorus fertiliser .

Phosphorus in water quality management

Phosphorus is the limiting nutrient for algae (autotrophic) growth in most fresh water bodies (lakes, rivers and reservoirs) and some

***Corresponding author:** Tom Brown, Department of Nucleic Acid Chemistry, University of Oxford ,UK, Tel: 16574521640;E-mail: BrownT@gmail.com

Received: 02-Mar-2023, Manuscript No. ico-23-93797; **Editor assigned:** 04-Mar-2023, PreQC No. ico-23-93797 (PQ); **Reviewed:** 18-Mar-2023, QC No. ico-23-93797; **Revised:** 24-Mar-2023, Manuscript No. ico-23-93797 (R); **Published:** 30-Mar-2023, DOI: 10.4172/2469-9764.1000216

Citation: Brown T (2023) Vertical bioreactors for the removal of Nitrogen and Phosphorus compounds from industrial and domestic wastewater. Ind Chem, 9: 216.

coastal waters influenced by river discharges. The anthropogenic discharge of phosphorus to these waters therefore increases the potential for algae growth, which is the starting point of eutrophication. Eutrophication is characterised by increased availability of phosphorus for primary production (algae) which represents the basic substrate for the aquatic ecosystems [6-8]. Even moderate anthropogenic increase of P availability influences the competition between the species which results in changes of the aquatic ecosystem. Beyond certain thresholds of phosphorus discharge the ecosystems shift to a completely different status with steadily increasing deterioration of water quality.

Conclusion

Natural environments normally are characterised by restricted dissolved phosphorus flows. Soil erosion results in relevant phosphorus loads depending on the P-content of the particulate material either coming from natural rocks and soils or from agricultural land. If this material remains under aerobic conditions in the waters and their sediments, availability of phosphorus for algae growth is low. municipal and industrial waste waters , drainage from agricultural land ,excreta from livestock ,diffuse urban drainage

References

1. Pacios M, Valle MD, Bartroli J, Esplandiu MJ (2008) Electrochemical behavior of rigid carbon nanotube composite electrodes. J Electroanal Chem 619: 117-124.
2. Salinas-Torres D, Huerta F, Montilla F, Morallon E (2011) Study on electroactive and elctrocatalytic surfaces of single walled carbon nanotube-modified electrodes. Electrochim Acta 56: 2464-2470.
3. Arvand M, Dehsaraei M (2013) A simple and efficient electrochemical sensor for folic acid determination in human blood plasma based on gold nanoparticles–modified carbon paste electrode. Mater Sci Eng C 33: 3474-3480.
4. Chandra U, Kumara Swamy BE, Gilbert O, Sherigara BS (2010) Voltammetric resolution of dopamine in the presence of ascorbic acid and uric acid at poly (calmagite) film coated carbon paste electrode. Electrochim Acta 55: 7166-7174.
5. Adam RN (1996) Electrochemistry at Solid Electrodes. Marcel Dekker, New York 73: 1098.
6. Chandra U, Kumara Swamy BE, Gilbert O, Pandurangachar M, Sherigara BS (2009) Voltammetric Resolution of Dopamine in presence of Ascorbic Acid at Polyvinyl Alcohol Modified Carbon Paste Electrode. Int J Electrochem Sci 4:1479-1488.
7. Kutluay A, Aslanoglu M (2013) Modification of electrodes using conductive porous layers to confer selectivity for the voltammetric detection of paracetamol in the presence of ascorbic acid, dopamine and uric acid. Sensors and Actuators B 185: 398-404.
8. Chandra P, Son NX, Noh HB, Goyal RN, Shim YB (2013) Investigation on the down regulation of dopamine by acetaminophen administration based on their simultaneous determination in urine. Biosens Bioelectron 39: 139-144.