Title

Harnessing algal power: Algal membrane photobioreactors revolutionizing toxic wastewater matter separation and treatment–A comprehensive review

Abstract

Background: The utilization of microalgae for the purposes of pollutant removal, wastewater treatment, and nutrient recovery aligns with the fundamental principles of the circular bioeconomy. These principles prioritize the transformation of waste materials into valuable products, while simultaneously safeguarding ecological systems. The integration of microalgae culture and wastewater purification techniques is a novel and promising strategy for addressing the challenges posed by environmental consequences, energy resource depletion, and water constraints. Methods: Microalgae photo-bioreactors (PBR) and membrane photobioreactors (MPBR) for wastewater cleanup involved in nutrient removal, particularly nitrogen and phosphorus. By utilizing microalgae for wastewater treatment, this approach offers the dual benefit of efficiently remediating wastewater while also yielding valuable biomass as a product. This combination presents an environmentally friendly and sustainable strategy for addressing both water quality issues and the demand for renewable resources. Significant findings: This current review presents microalgae remediation methods for heavy metals, focusing on phycoremediation difficulties and possible solutions. Addressing these difficulties improves phycoremediation efficiency, economic feasibility, sustainability, and environmental friendliness. This review also discusses MPBR advances in nutrient recovery and wastewater cleanup. This study investigates whether microalgae-based wastewater treatment can efficiently manage high-nutrient effluents. © 2024

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Year

2024

Source title

Journal of the Taiwan Institute of Chemical Engineers

Art. No.

105506

DOI

10.1016/j.jtice.2024.105506

Link

https://www.scopus.com/inward/record.uri?eid=2-s2.0-85190938941&doi=10.1016%2fj.jtice.2024.105506&partnerID=40&md5=d4ed89b87dfc871fe71e696fc5f97440

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Author Keywords

Bioremediation; Membrane photobioreactor (MPBR) toxic effluent; Microalgae; Nutrient recovery

Index Keywords

Bioremediation; Chemicals removal (water treatment); Heavy metals; Microorganisms; Nutrients; Sustainable development; Toxic materials; Wastewater treatment; Water quality; Ecological systems; Fundamental principles; Membrane photobioreactor toxic effluent; Membrane photobioreactors; Micro-algae; Nutrient recovery; Phycoremediation; Pollutants removal; Power; Toxic effluents; Microalgae

Funding Details

Agencia Nacional de Investigación y Desarrollo, ANID; Fondo Nacional de Desarrollo Científico y Tecnológico, FONDECYT, (11220730); Fondo Nacional de Desarrollo Científico y Tecnológico, FONDECYT

Funding Texts

The author (L.G) acknowledges the support of ANID through the project Fondecyt Iniciaci\u00F3n No: 11220730.

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Publisher

Taiwan Institute of Chemical Engineers

ISSN

18761070

Language of Original Document

English

Abbreviated Source Title

J. Taiwan Inst. Chem. Eng.

Document Type

Article

Publication Stage

Article in press

Source

Scopus

EID

2-s2.0-85190938941