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Purification of post fermentation broths applying microalgae

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Microalgae offer a promising solution by absorbing nutrients, reducing eutrophication, and sequestering carbon dioxide. This approach is energy-efficient and sustainable, with the added benefit of producing biomass that can be used for biofuels and other products. Microalgae can also remove pathogens and heavy metals, improving water quality. The research involves the application of microalgae from the Baltic Sea, a region with significant pollution, to develop a purification process. This research is crucial due to ecological changes in the Baltic ecosystem. Algal biological processes, particularly direct biophotolysis, involve the photosynthetic production of hydrogen from water. Algae like *Chlamydomonas reinhardtii*, *Platymonas subcordiformis*, and *Chlorella species* are efficient at capturing solar energy and producing hydrogen. Increasing cell density and adding external carbon sources like sugars can enhance hydrogen production. Creating anaerobic conditions is crucial for algae to switch from oxygen to hydrogen production. The research proposes using microalgae to detoxify fermentation broths and biofiltration effluents. It focuses on bioenergy and bioprocesses as sustainable energy solutions, crucial for transitioning to a low-carbon future and aims to establish effective biological cleaning systems and strategies for managing leachates and post-fermentation broths. The scientific novelty lies in using model and natural-origin microalgae to develop a sustainable method for purifying sewage streams, optimizing growth conditions, and contributing to a circular economy. Untreated sewage introduces harmful pollutants into aquatic ecosystems, posing health risks to humans and wildlife, and causing eutrophication, which depletes oxygen levels and harms aquatic life. Aging sewage infrastructure exacerbates these issues by causing frequent overflows and leaks. Effluents from fermentation and biofiltration have varying compositions and environmental impacts. Fermentation effluents have high organic matter, leading to elevated biochemical and chemical oxygen demand. Biofiltration reduces organic pollutants but may leave residual nutrients. Comprehensive treatment of all effluents is essential to minimize environmental impact and ensure regulatory compliance

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