Bacterial Cellulose production: valorization of wastewater and Life Cycle Assessment

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Abstract

Low-cost substrates, most from agro-industrial wastes, have increasingly been exploited as nutrient sources for the fermentation of bacterial cellulose (BC), an appealing approach from an economical and environmental point of view. However, these wastes carry a very high organic load, which, while advantageous for the fermentation, generate high organic load wastewaters as well, which require proper treatment before the release or recycling of the treated water, which may have a significant impact in the economic and environmental sustainability of the BC production.
Anaerobic digestion (AD), a process that produces biogas (primarily a mixture of methane and CO2) typically used for lighting and heating, is one of the most appropriate and promising treatments for high loaded industrial wastewaters. In this work, wastewaters from BC fermentation were characterized, as well as their biochemical methane potential and anaerobic biodegradability. The performance of an upflow anaerobic sludge blanket reactor (UASB) for the treatment of these wastewaters was also evaluated. Briefly, A relevant among of biogas could be produced from AD, while reducing the chemical oxygen demand (COD, an indirect measure the amount of organic compounds) of the treated waters [1].
The Life Cycle Assessment (LCA) is a methodology used to quantify the environmental, health and resource depletion impacts related to products, processes, and services. A LCA was used to a projected production of BC under static culture, including wastewater treatment, following a cradle-to-gate approach. From this study, a considerable amount of water is consumed, most of which being treated and emitted to the environment (to fresh water). The BC production facility itself had a small contribution to the consumption of resources and environmental impact of the global life cycle, most of which were associated with the production and transport of materials. Further, a comparative LCIA was made against plant celluloses. Briefly, with the increasing environmental awareness, BC production may be a strong candidate towards the reductions of environmental impacts and risks, concerning climate change and fossil resource depletion, while providing a viable, economically and environmentally sustainable bioproduct, with unique properties for a wide range of market applications [2].

References

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