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Majid Hosseini

The University of Texas Rio Grande Valley, USA

Technical challenges of large-scale microalgae harvesting for feed, food and biofuels production

Presently, commercially produced microalgae are used in supplemental nutritional products for humans and animals. There is a great potential for microalgae to be used in food/feed supplements, biofuels production, electricity generation, carbon dioxide biofixation, etc. Throughout the world, many variations on cultivation methods, species of microalgae, harvesting means and the biomass processing technology have been implemented. Even though microalgae biomass has been rigorously studied in both the laboratory and in the field for years, its usefulness is impeded by the difficulty experienced in its large scale cultivation thereby making it commercially infeasible. Nevertheless, there are multiple issues that must be addressed before the widespread adoption of algal biomass production technology. Several species are already being used commercially in raceway ponds, but are still not produced in high enough quantities or in a cost effective manner that is required for fuels and feeds. While algae biomass demand continues to increase globally, producers require technological developments that drive cost reduction while retaining and elevating the quality of the product. Low cost, efficient and scalable harvesting and subsequent dewatering methods require technological advancement in order to drive cost reduction of downstream processing and ultimately biofuel production. The favorability of the carbon and energy balance is what determines the microalgae feedstock's viability for the production of biofuel. In order to achieve large-scale production levels, not only must processing costs be drastically cut, but more importantly is the development of algae strains that are highly productive and can be cheaply harvested. The systems used for the identification, promotion and utilization of algal biomass are sought after by producers and processors alike so as to ensure profitability, supply security, eco-consciousness, sustainability, market competitiveness, and etc. This work detailed the challenges that microalgae biomass production and utilization face which span the breadth of the algal production chain. Constraints, both chemical and physical in nature, that obstruct mass production and application of large scale algal biomass is also addressed herein. Comparisons between various microalgae harvesting methods and their potential for scalability are discussed. Furthermore, a discussion on the technical, economic and environmental barriers that must be surmounted prior to the introduction of microalgae-based products into the global market is presented.

Biography

Majid Hosseini has earned both his PhD and MS degrees in Chemical Engineering from The University of Akron, USA. He has also completed his Bachelor's degree in Chemical Engineering at Sharif University of Technology, Iran. His research interests, expertise and experiences are very diverse, ranging from biofuels and renewable energy to industrial biotechnology, bioprocess engineering and development, sustainability, bionanotechnology, intelligent polymers and coatings, micro/encapsulation and nanoparticles for biomedical applications. He has been actively engaged in various fields of biofuels & bioenergy, sustainability, polymers, bio/nanotechnology and related technology development both in industry and academia. He is the Editor of a book published by Springer in 2016 entitled *Industrial Applications for Intelligent Polymers and Coatings*. He is a persistent Reviewer of numerous leading international journals, has published high caliber research articles and book chapters and co-invented US and international patent application technologies. He has been a Member of several professional bodies in the USA including: The New York Academy of Sciences, American Institute of Chemical Engineers (AICHE), AICHE-Institute for Sustainability, AICHE-SBE (Society of Biological Engineering), Design Institute for Emergency Relief Systems (DIERS), International Society for Pharmaceutical Engineering (ISPE), AICHE-Sustainable Engineering Forum, AICHE-Pharmaceutical Discovery, Development and Manufacturing Forum and The National Society of Collegiate Scholars.

majid.hosseini01@utrgv.edu