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Editorial

Bioprocess Development for Biofuels and Bioproducts

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The increasing pursuit of green technology and renewable resource products has fostered a dramatic interest in biofuels and bioproducts globally. Primarily, this is due to the potentials displayed by biofuels and bioproducts in curbing current global warming issues through sustainable conversions of biomass into valuable consumer products. The development of biofuels and bioproducts creates pathways independent on petroleum but towards a more secure transport and manufacturing future with a lower greenhouse gas signature. In particular, biofuels and bioproducts have demonstrated the capacity to support the growth of agriculture, forestry, and rural economies and to foster major new domestic industries such as biorefineries to make a variety of fuels, chemicals, and other products. Examples of these products include bioethanol, biodiesel, biohydrogen for biofuels, and a range of bioproducts from low volume high value products to high volume low value products such as biopolymers and renewable chemicals including propanediol and lactic acid. Of course, the selected topics and papers are not an exhaustive representation of the area of bioprocess development for biofuels and bioproducts. Nonetheless, they represent the rich and many-faceted knowledge that we have the pleasure of sharing with the readers. We would like to thank the authors for their excellent contributions and patience in assisting us. Finally, the fundamental work of all reviewers on these papers is also very warmly acknowledged.

This special issue contains five papers, where two papers are related to energy and the environment, two papers cover algal resources, and the last one covers conventional biodiesel production and optimization.

In the first paper, Luo et al. present “Energy and environmental performance of bioethanol from different lignocelluloses.” The paper deals with the use of cellulosic processing technologies to convert different lignocellulosic biomass to fuel ethanol. Seven different studies were conducted to permit a direct comparison of fuel ethanol from different lignocelluloses in terms of energy use and environmental impact and are summarized in this paper. The work provides an overview on the energy efficiency and environmental performance of using fuel ethanol derived from different biomass feedstocks in comparison with gasoline.

In the second paper, Irvine et al. present “Energy from waste: reuse of compost heat as a source of renewable energy.” An in-vessel tunnel composting facility in Scotland was used to investigate the potential for collection and reuse of compost heat as a source of renewable energy. The amount of energy offered by the compost was calculated and seasonal variations analysed. From the report, using the heat of the compost was found to provide the most reliable level of supply at a similar price to competing sources.

In the third paper, Baliga and Powers present “Sustainable algae biodiesel production in cold climates.” The paper employs life cycle assessment to determine the most suitable operating conditions for algae biodiesel production in cold climates to minimize energy consumption and environmental impacts. Two hypothetical algae photobioreactor production and biodiesel plants located in Upstate New York (USA) were utilized for the analysis. The results obtained were compared with that of soy biodiesel.

In the fourth paper, Hosikian et al. present “Chlorophyll extraction from microalgae: a review on the process engineering aspects.” This review discusses the process engineering of chlorophyll extraction from microalgae. It presents an upstream scenario where microalgal cultivation is used for capturing CO₂ and wastewater treatment and some downstream extraction technologies. Different chlorophyll extraction methods and chlorophyll purification techniques are evaluated. The report suggests supercritical fluid extraction as a promising technology for chlorophyll extraction and high-performance liquid chromatography as a power spectroscopic technique for accurate analysis of chlorophyll molecules.

In the fifth paper, Boulifi et al. present “Process optimization for biodiesel production from corn oil and its oxidative stability.” They used response surface methodology (RSM) based on central composite design (CCD) to optimize biodiesel production from corn oil. The process variables, temperature, and catalyst concentration were found to have significant influence on biodiesel yield amongst other variables.

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