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Keywords: Microalgae; Biofuels; Lipid; Biomass; Glycerol; Transesteri cation

Abbreviation: ASTM: American Society of Testing Materials; FAME: Fatty Acid Alkyl Ester; TAGs: Try Acyl Glycerol's; MFC: Microbial Fuel Cell; MAO: Microalgae Oil; TG: Triglycerides; PAHs: Polycyclic Aromatic Hydrocarbons

Introduction

e search for sustainable and renewable fuels is becoming increasingly important as a direct result of climate change and rising fossil-fuel prices. Current commercial production of biodiesel or Fatty Acid Methyl Ester (FAME) involves alkaline-catalyzed transesteri cation of triglycerides found in oleaginous food crops with methanol [1]. Biodiesel is produced from triglycerides derived mainly from vegetable oils or animal fats. Recently, new oil production methods have been investigated such as oil produced from algae and oleaginous yeasts indicating new sources of biodiesel which, contrary to energy crops, do not con ict with the cultivation of land for food, therefore they can o er alternatives to the food vs. fuels land use. Biodiesel has been thoroughly tested and can be used as an alternative fuel in both boilers and internal combustion engines either in a pure form or blended with petroleum-based diesel [2]. Petroleum-based fuels are recognized as unsustainable energy source due to their depleting supplies and contribution to global warming. Renewable biofuels are promising alternatives to petroleum-based fuels, among which biodiesel has attracted the most attention in recent years. Biodiesel is a diesel-equivalent fuel derived from biological feedstocks and is chemically referred to as a Fatty Acid Methyl Ester (FAME). Compared with traditional fuels, biodiesel is carbon neutral, contributes less emission of gaseous pollutants and hence is environmentally bene cial [3].

Competitive liquid biofuels from various biomass materials by chemically and biochemically have been found promising methods for near future. Liquid biofuels may o er a promising alternative to petroleum based transportation fuels. ere are two global liquid algae, crop wastes, perennial grasses, wood and wood wastes are still in pre-commercial stages [4].

Cost and environmental impact of conversion process

For a sustainable future of the planet, we must look into renewable energy sources which implicitly include sustainable fuel sources. Based on the positive energy balance or life cycle analysis, biodiesel is shown to be sustainable. However, competition of feed source with food, and destruction of natural habitats resulting from energy crop plantation are some inevitable issues which require attention. Furthermore, various aspects in increasing the economic perspectives of the biodiesel are examined [5].

We highlight the important aspects of the biodiesel which will strengthen the prospect as the next generation green fuel. Four major areas are discussed:

(i) Cost and environmental impact of conversion processes

(ii) E orts towards environmentally benign and cleaner emissions

(iii) Diversi cation of products derived from biodiesel glycerol

(iv) Policy and government incentives [6].

Flow digram of microalgal oil discription

High acidic value of Microalgae Oil (MAO) makes them an inconvenient raw material for the traditional biodiesel production. However, by means of a sequential acidic esteri cation/basic is as biodegradable as sugar and has a high ash point compared to petroleum diesel fuel. Biodiesel can be used alone or mixed in any ratio

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