World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:14, No:12, 2020

Lipid Extraction from Microbial Cell by Electroporation Technique and Its Influence on Direct Transesterification for Biodiesel Synthesis

Authors : Abu Yousuf, Maksudur Rahman Khan, Ahasanul Karim, Amirul Islam, Minhaj Uddin Monir, Sharmin Sultana, Domenico Pirozzi

Abstract : Traditional biodiesel feedstock like edible oils or plant oils, animal fats and cooking waste oil have been replaced by microbial oil in recent research of biodiesel synthesis. The well-known community of microbial oil producers includes microalgae, oleaginous yeast and seaweeds. Conventional transesterification of microbial oil to produce biodiesel is lethargic, energy consuming, cost-ineffective and environmentally unhealthy. This process follows several steps such as microbial biomass drying, cell disruption, oil extraction, solvent recovery, oil separation and transesterification. Therefore, direct transesterification of biodiesel synthesis has been studying for last few years. It combines all the steps in a single reactor and it eliminates the steps of biomass drying, oil extraction and separation from solvent. Apparently, it seems to be cost-effective and faster process but number of difficulties need to be solved to make it large scale applicable. The main challenges are microbial cell disruption in bulk volume and make faster the esterification reaction, because water contents of the medium sluggish the reaction rate. Several methods have been proposed but none of them is up to the level to implement in large scale. It is still a great challenge to extract maximum lipid from microbial cells (yeast, fungi, algae) investing minimum energy. Electroporation technique results a significant increase in cell conductivity and permeability caused due to the application of an external electric field. Electroporation is required to alter the size and structure of the cells to increase their porosity as well as to disrupt the microbial cell walls within few seconds to leak out the intracellular lipid to the solution. Therefore, incorporation of electroporation techniques contributed in direct transesterification of microbial lipids by increasing the efficiency of biodiesel production rate.

Keywords : biodiesel, electroporation, microbial lipids, transesterification
Conference Title : ICSRD 2020 : International Conference on Scientific Research and Development
Conference Location : Chicago, United States
Conference Dates : December 12-13, 2020