

Biofuel from Microalgal Biomass & Fuel Property Characterization: Way Forward to a Microalgal Biorefinery

KID: 20230205



The current global energy crisis is driving the search for alternative clean energy sources like biofuels, promising substitutes for fossil fuels. In 2018, the Indian Ministry of Petroleum and Natural Gas published the “National Policy on Biofuels” to reduce the import of petroleum products by fostering domestic biofuel production. And on 15th March 2023, the Indian Ministry of Road Transport & Highways issued a notification to promote eco-friendly means of transportation and to decarbonize the transport sector. Biofuels are produced from renewable feedstocks and, upon combustion, emit less amount of GHGs than fossil fuels.

Biofuels produced by current biochemical and thermochemical processes contain small amounts of cyclic hydrocarbons, which are identified as critical components of petroleum fuel. These cyclic hydrocarbons help in the efficient combustion of fuel, resulting in more energy release and less production of CO. These biofuels can provide the requisite performance characteristics upon blending with petroleum fuels by enhancing the lubricity and octane number. With a higher octane number, there is very less probability of knocking or detonation.

Our research focuses on biofuel from microalgae, as many microalgal strains accumulate higher amounts of lipids with faster biomass growth and higher photosynthetic yield, can be cultured in non-arable land and offer opportunities for mitigating global climate change, allowing wastewater treatment and carbon dioxide sequestration. Several challenges remain in this domain, like a robust microalgae strain, low lipid yield under limiting growth conditions, and slow growth in high lipid content strains. **This study aims to enhance microalgae lipid production, efficient lipid extraction for converting into biofuel, and diesel engine tests using diesel-microalgae biodiesel blends.**

We started working with incorporating the application of nanoparticles to microalgae, growing in synthetic wastewater, to check the impact of nanoparticles on lipid accumulation in microalgae. Seeing a positive impact, we are trying to optimize factors that influence lipid accumulation in microalgal cells (Fig. 1).



Biofuel from microalgae, set-up at IITH

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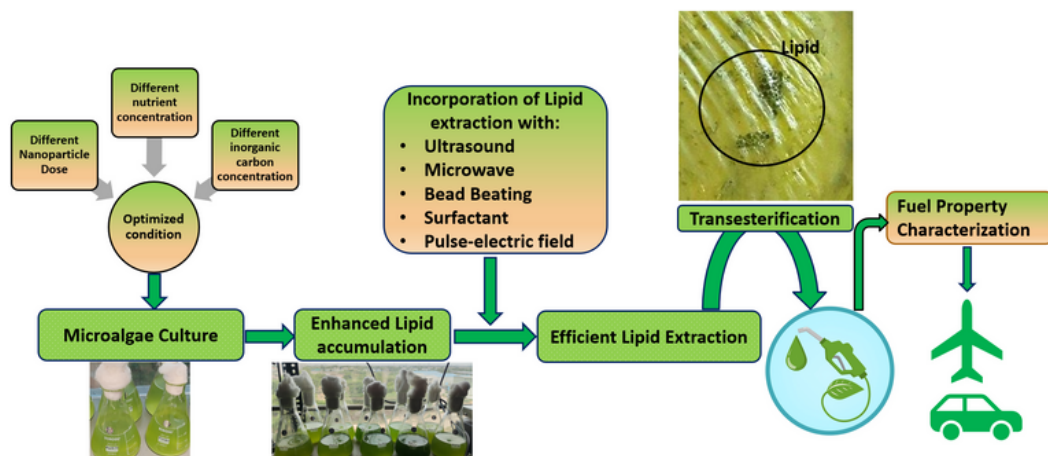


Fig. 1: Graphical Illustration of the work process