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## **Lipid-extracted Algae to Value Added Products: a Review**

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**Abstract.** The squandering supplies of fossil fuels accompanied by the fractious burning of petrol, diesel, gasoline and coal are the major issues that the whole world is currently facing. Hence, the world is migrating towards greener and more sustainable energy sources to reduce the effects from fossil fuels burning, such as global warming, climate change, acid rain and greenhouse gases (GHG) emissions. Among the available alternatives are the exploration of renewable energy options, such as solar energy, wind energy, hydro energy, biomass and fuel cells. Biomass is one of the preferred options for biofuel generation, such as biodiesel and bioethanol. Among established methods explored for biofuel manufacturing is transesterification of algal oil extracted from algae after algal oil extraction technique. Algae are simple eukaryotes that are present in the size range from microalgae to large seaweeds, which can be further classified in groups according to their color, for instance, blue algae, green algae and red algae. They have similar properties to plants that enable them to store nutrients which can be processed into biofuel, health supplements, food and beverages as well as filter in waste water treatment. The algal oil extraction step creates algal residue which still contains proteins and carbohydrates and has wide potential to be transformed to value-added products to avoid dumping the useful leftover-extracted algae (LEA) into the environment. For instance, livestock feed and feedstock for bioethanol generation and biogas generation. Since the world is shifting towards third generation biofuel or algal fuel, more LEA downstream processing methods should be introduced in order to consume algae as the new source of fuel effectively. This paper presented the pathways of microalgae to biofuel generation and downstream processing of LEA to value added products via different approaches.

**Keywords:** algae, biofuel, lipid-extracted algae, animal feed, biogas, activated carbon, synthesis gas, bio-oil, bio-char, fertilizer