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# A Holistic-Hierarchical Approach for Production of Energy Blocks from Microalgae

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**Abstract :** Microalgae biomass can potentially be exploited for the production of biofuels because their photosynthetic mechanism allows collecting energy in a more efficient way than terrestrial plants. However, biotechnological use of microalgae biomass for biofuel production presents various bottlenecks at different stages to prevent the sustainable use of this energy crop. In this research paper, the joint use of experimental techniques, characterization, process modeling, sensitivity analysis and process simulation is shown in a holistic-hierarchical approach to improve the supply chain, emphasizing the production of fermentable sugars and oil as energy blocks or precursors of third generation biofuels is presented. The hierarchical part of the approach sets experimentation as a tool for selection of raw materials and improving efficiency, and uses modeling and simulation to minimize the use of natural resources allowing selecting technologies and processing routes. The results of implementation show in the experimental part an increase in the production of total sugars and cell wall disruption of 87 % of extraction efficiency for 120 minutes using acid hydrolysis, and 94% using a polyfunctional process. While the modeling and simulation results show that the technology of simultaneous saccharification and co-fermentation allows higher efficiency of ethanol production.

**Keywords :** Holistic approach, Microalgae, Modeling, Simulation.

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