Exergy and Enviromental Analysis (ExEA) of Microalgae Oil Extraction for Bioenergy Production

Pardo, Y.1; Peralta, Y.1; Kafarov, V.1
1- Universidad Industrial de Santander, Colombia

Introduction

The potential of microalgae as a feedstock for biofuels is high, due to its composition and high photosynthetic efficiency. In the process of biodiesel production, the extraction step has a high energy consumption. In this paper was simulated the solvent extraction methods performed on a laboratory scale using process simulation software Aspen Plus® 7.1, using as feedstock the genre of microalgae *Chlorella sp*. using as solvent mixtures ethanol-hexane and methanol-chloroform. Exergy losses of the processes and their environmental impacts were estimated In order to propose the best conditions for industrial-scale operation of the extraction methods.

Results and Conclusions

The balances of mass, energy and exergy for each method were developed. The impact categories considered were: climate change, acidification, photo-oxidant formation, eutrophication, respiratory effects, using SIMAPRO ® 7.1 software.

(ExEA) evaluation confirms the potential of third-generation biofuels as an energy source, but establishes that is necessary to make some technical improvements on the extraction step to increase the exergetic efficiency and reduce environmental impacts of the process.

The authors thank the Ministry of Agriculture and Rural Development for their support through the project Bioprospecting of Colombian microalgae for biodiesel production code 2008D32006-6710, the Colombian Petroleum Institute (ICP-ECOPETROL), the Department of Science, Technology and Innovation COLCIENCIAS, the Institute Morrosquillo Corporation and the Ibero-American program of Science and Technology for Development CYTED.

Author publications

Pardo, Y., Sanchez, E., Kafarov, V. 2010. Life Cycle Assessment of Third Generation Biofuel Production. Chemical Engineering Transactions, Vol 21, 1177-1182.

Peralta, Y., Sanchez, E., Kafarov, V. 2010. Exergy Analysis for Third Generation Biofuel Production from Microalgae Biomass. Chemical Engineering Transactions, Vol 21, 1363-1368.