Bioresource Technology 134 (2013) 219–226

Contents lists available at SciVerse ScienceDirect

Bioresource Technology

journal homepage: www.elsevier.com/locate/biortech

# *Nannochloropsis* sp. biomass recovery by Electro-Coagulation for biodiesel and pigment production

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## HIGHLIGHTS

- *Nannochloropsis* sp. microalga was recovered by Electro-Coagulation (EC).
- The biomass harvesting with EC can reach more than 97%.
- The best operational conditions were 8.3 mA $cm^{-2}$, 10 min.
- No significant changes were detected in the quality of biomass after EC treatment.
- EC before centrifugation decreases drastically the harvesting' energy demand.

## ARTICLE INFO

*Article history:*
Received 20 December 2012
Received in revised form 13 February 2013
Accepted 14 February 2013
Available online 22 February 2013

*Keywords:*
*Nannochloropsis* sp.
Harvesting
Electro-Coagulation
Pigments
Biodiesel

## ABSTRACT

Biofuel production from microalgal biomass could be an alternative solution to conventional biofuels typically dependent on food and high land/water demanding crops. However, the economic and energetic viability of microalgal biofuels is limited by their harvesting processes. The finding of innovative, low cost and efficient harvesting method(s) is imperative.

In this study, the Electro-Coagulation (EC) was studied as a process to harvest the marine *Nannochloropsis* sp. microalga.

Several EC operational conditions were studied and the best EC recovery efficiency (>97%) was achieved using a current density of 8.3 mA $cm^{-2}$ for 10 min. The quality of the recovered microalgal biomass was evaluated in terms of total lipids, fatty acid and pigment profile where no significant differences were observed after EC treatment. The energy requirements of the harvesting process were estimated and the combination of EC and centrifugation processes proved to decrease significantly the energy demand when compared with the individual process.

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## 1. Introduction

The potential uses of microalgal biomass is absolutely enormous and range from biofuel, biochem, bioplastic, biomass livestock feed production, to high-value compounds, useful in the nutritional, cosmetic and pharmaceutical/medical industries (Gouveia, 2011).

Between the photosynthetic organisms microalgae have the fastest grow and highest $CO_2$ sequestration rates, without the need of arable land or potable water. Additionally, cultivation of microalgae will not compete with food and can capture several greenhouse gases. However, the practical full scale implementation of microalgal biomass processing has been so far hindered by economic constrains related to microalgae poor volumetric efficiency. The energy inputs during the production of microalgal biomass are very high and often exceed the energy content of the microalgal biomass (Pienkos and Darzins, 2009; Wijffels and Barbosa, 2010). To diminish these constrains research efforts are focusing both the development of new processing technology and biotechnological improvements – (*via* genetic engineering of microalgae (which is still in its infancy) (Walker et al., 2005; Coll, 2006), *via* process engineering or *via* high throughput genetic selection procedures (Pereira et al., 2011).

Several technological advances are still necessary to improve, namely the microalgal biomass productivity, harvesting and dewatering and the extraction of possible by-product valorization (such as carotenoids and oils) (Wijffels et al., 2010). However, the main bottle-necks of microalgae processing are the energy and cost intensive processes of biomass harvesting and dewatering, which represent the main percentage of the total production costs (Poelman et al., 1997). The literature reports that microalgal biomass harvesting contributes to 20–30% of the total costs of microalgal biomass production (Molina-Grima et al., 2003).

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0960-8524/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.biortech.2013.02.034