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Microalgae harvesting using ozoflotation: Effect on lipid and FAME recoveries

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ABSTRACT

Developing an economical algae harvesting system still remains a challenge today. One of the strategies to decrease harvesting costs prior conversion is employing technologies that can have additional benefits apart of separation. In this work we explore ozoflotation as a technique to recover microalgae grown in treated wastewater and we evaluate the effect of ozone on lipid and FAME recoveries. A high percentage of biomass can be harvested (79.6% as TSS) when using an ozone dose of 0.23 mg/mg of dried biomass. Additionally, two interesting effects of ozone were found in this study. The amount of lipid extracted and FAME recovered from the biomass, at least, doubles when using ozoflotation (with ozone doses of 0.12–0.23 mg/mg of dried biomass) than when using centrifugation. And, the oxidative stability of biodiesel can be enhanced by the effect that ozone has in the degree of FAME saturation.

1. Introduction

In recent years, there has been increased research in the potential of using microalgae for biodiesel production. One of the limitations in the microalgae process is the operational costs needed before obtaining biodiesel. Reusing wastewater has been proposed as a way to decrease microalgae growth costs, as a nutrient removal from wastewater and carbon sequestration can also be achieved. Pittman et al. [1] reviewed the potential of algal biofuel production and concluded that according to current technologies, algae cultivation for biofuels without the use of wastewater is unlikely to be economically viable.

After growth, biomass harvesting, is estimated to account between 20 and 30% of total biodiesel production costs [2]. The increased harvesting cost is a consequence of the low concentrations of microalgae in solution (1–8 g/L) obtained in cultivation systems [3], small size of microalgae cells (3–300 μm) and low microalgae density differences with culture water (average ~1020 g/L) [4,5]. Developing an economical algae harvesting system remains a challenge today, the most common harvesting techniques include centrifugation, filtration, gravity sedimentation, dissolved air flotation, and flocculation; or a combination of processes [2,6,7].

One of the strategies to decrease harvesting costs prior conversion is employing technologies that can perform several treatments apart from separation. In this case, the

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