

OC4) Effect of Operational Parameters on the Removal of *Microcystis aeruginosa* in Electro-flotation

Arpon Lucero Jr · Dong-Seog Kim · Young-Seek Park¹⁾

Department of Environmental Science, Catholic University of Daegu

¹⁾DU University College, Daegu University

1. Introduction

Despite the low removal efficiencies reported by previous studies, electro-flotation still stands out among other microalgae removal methods as far as the economical and environmental factors are concerned. To enhance the removal efficiency, investigation on the important factors that limit the performance of this method must be carried out. In this study, the possibilities of increasing the removal efficiency of microalgae have been explored by investigating the effects of several important variables in electro-flotation.

2. Materials and Methods

Microcystis Aeruginosa from KMMCC (Korean Marine Microalgae Culture Center, AG10159) was mass cultivated in a 120 L photo-bioreactor using JM (Jaworski's medium) as growth media. The reactor used in the experiment was made of plexiglas (thickness = 0.5 cm) with dimensions of 5.5 cm x 6.0 cm x 60 cm (1980 cm³).

The electrodes used in the experiment were made of stainless steel mesh (Woven mesh, 12 mesh 1.61 mm; wire thickness, 0.5 mm) with a 24.75 cm² effective surface area. Eight parameters namely flotation time, rising time, current density, pH, conductivity, electrode distance, temperature, and initial concentration were evaluated in this study using a one-parameter-at-a-time approach. Original values of pH(8.5±0.4), temperature(25±0.5°C), and electrical conductivity(0.375±0.010 ms/cm) of the culture medium and presumed values such as current(0.5A) and electrode distance(6 mm) were used as initial parameters. Experiments at lower temperatures were attained by submerging a 1 L beaker into a refrigerated batch circulator(WCR-P22, Daihan Scientific Co., Ltd.) until the temperature of the culture is equal to the desired temperature before performing electro-flotation. All electro-flotation experiments were performed in triplicates and in each parameter, an ideal value was selected based on the microalgal removal efficiency (MRE).

3. Results and Discussion

Results have revealed that the operational parameters which greatly affected the removal efficiency of microalgae are electro-flotation time, current density, pH, and initial concentration. The microalgal removal efficiency increased with electro-flotation time, current density and initial concentration however, removal efficiency was highest when the pH was at the extreme values (pH 3 and 11). These parameters can be classified as critical factors due to their direct effect on microalgae removal and therefore can be used as basis for further research such as optimization through modeling where interaction effects are also being considered.

On the other hand, other parameters tested such as conductivity, electrode distance, and temperature showed insignificance relative to removal efficiency, nevertheless, it exhibited an indirect effect on power. Narrower electrode distance and higher conductivity and temperature lowered the power requirement which, nowadays considered as equally important aspect in running a feasible and economically efficient electro-flotation process.