ALGAE INACTIVATION TROUGH THE APPLICATION OF ELECTRIC FIELDS

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In recent years, there has been a growing concern about environmental pollution, prompting the exploration of urgent solutions to address various ecological challenges. One of the most significant threats to our planet is climate change, induced by greenhouse gases, primarily originating from the combustion of fossil fuels for electricity generation, heating, transportation, and other purposes. Among greenhouse gases, carbon dioxide is the most crucial, resulting from emissions released by heavy industries [1].

Algae play a vital role in aquatic ecosystems; however, under certain conditions, uncontrolled algae growth may lead to the proliferation of harmful algal blooms, adversely affecting water quality, aquatic life, and human health. Traditional methods of algae control involve the use of biocides and chemical substances, potentially causing negative environmental impacts. Consequently, there is a growing need for alternative and sustainable approaches to combat algae growth. The flourishing of algae and biological contamination pose significant challenges across various industries, including water treatment, aquaculture, and energy production. Control and inactivation of algae often rely on chemical treatments, which can have detrimental effects on the environment. In recent years, the application of electric fields has gained attention as an alternative method for algae inactivation [2].

Certain microalgae tend to proliferate explosively in eutrophic waters, leading to the formation of algal blooms, disrupting ecological balance, and posing a threat to water quality. Microalgal cells and extracellular releases, as potential precursors, may transform into carcinogenic disinfection by-products during water treatment, posing risks to human health [3]. Additionally, some microalgae naturally produce algal toxins, poisoning aquatic organisms and posing a danger to public health [4]. Therefore, effective control of algal blooms remains a key task in water pollution control.

Currently, physical removal, chemical treatment, biological manipulation, and ecological management are the main approaches to algae bloom control [5,6]. Using electric fields to create potential differences across cell membranes and increase electrical permeability has proven to be an effective way to eliminate harmful microorganisms [7]. It also demonstrates potential as a technique for the inactivation of algae.

In this study, we aim to investigate the efficiency of electric fields in algae inactivation and determine the optimal conditions for significant reduction of algal populations.

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