Mathematical simulation to up-scale electrolysis for effective suppression of freshwater cyanobacteria

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\textbf{ABSTRACT}

Electrolysis, originally applied for removal of various pollutants from water and wastewater, has been recently found to be successful in the suppression and removal of cyanobacteria in freshwaters. Existing studies addressed crucial operational parameters based on batch laboratory studies; however, only very few studies have projected this information for continuous process to up-scale for industrial application. Oxygen Productive Electrode (OPE), a new type of electrolysis unit, is recommended as pre-treatment of freshwaters polluted by cyanobacterial blooms prior to conventional water treatment process. In this study, the data on suppression rate of \textit{Aphanizomenon} \textit{sp.}, a filamentous cyanobacteria, from prior experimental work were used to mathematically evaluate the effects of configuration of OPEs as a pre-treatment stage of a water treatment plant. As it was found, the single-stage batch OPE was observed to be less effective on filamentous cyanobacteria than on coccus and unicellular cyanobacteria, thus an engineering consideration was made to improve system efficiency by estimating the overall system efficiency when multiple OPEs were implemented in series in continuous operation at steady state.

\textbf{Keywords:} Filamentous; Cyanobacteria; Electrolysis; Freshwaters; Industry; OPEs in series

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