

## Evaluation of a seawater electrolysis process considering formation of free chlorine and perchlorate

Byung Soo Oh<sup>a</sup>, Sang-Guen Oh<sup>a</sup>, Yeon Jung Jung<sup>b</sup>, Yun-Young Hwang<sup>b</sup>, Joon-Wun Kang<sup>b</sup>, In S. Kim<sup>a\*</sup>

<sup>a</sup>Center for Seawater Desalination Plant, GIST, Oryong-dong, Buk-gu, Gwangju, Korea  
Tel. +82 (62) 970-3381; Fax +82 (62) 970-2584; email:iskim@gist.ac.kr

<sup>b</sup>Department of Environmental Engineering, YIEST, Yonsei University, Wonju, Gangwon, Korea

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### ABSTRACT

This study evaluated the possibility of an electrochemical process as a pre-treatment of a seawater reverse osmosis (SWRO) desalination plant. Initially, during electrolysis of seawater the formation trend of free chlorine was observed and then inactivation rate of *Bacillus* sp. isolate obtained from natural seawater was measured to evaluate the potential for reducing biofouling of SWRO membrane. As a result, the *Bacillus* sp. spores present in seawater were completely inactivated at approx. 210 s of electrolysis time, showing 2.4-time higher inactivation rate compared to chlorination alone. This study also investigated the formation trend of perchlorate ( $\text{ClO}_4^-$ ) during electrolysis of seawater and its rejection by microfiltration and the SWRO membrane. After 5 min of electrolysis, 27  $\mu\text{g/L}$  of  $\text{ClO}_4^-$  was produced. It was also found that 20% and 98% rejection efficiencies of  $\text{ClO}_4^-$  were observed through microfiltration and SWRO filtration. The optimum condition of the electrochemical process as a pre-treatment in the seawater desalination plant was determined to be ~4 min of electrolysis time and 110  $\text{mA/cm}^2$  of current density under the tested natural seawater condition.

*Keywords:* Electrolysis; Chlorination; Biofouling; Perchlorate; Seawater; Desalination

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\* Corresponding author.