

Development of a theoretical free chlorine species formation model for the electrochemical ballast water treatment system

차법준, 박용하, 박찬호, 이창하, 문 일[†]

연세대학교

(ilmoon@yonsei.ac.kr[†])

A rigorous model is developed to describe the production rate and the concentration profile of germicidal free chlorine species for the electrochemical ballast water treatment system with parallel plate electrodes. The secondary current distribution of the seven parallel plate electrodes is calculated through the numerical model. The model contains electrochemical reaction kinetics, ionic diffusion and electric migration in the electrolyte to evaluate the production rate of chlorine, oxygen and hydrogen at the electrode surface during artificial seawater electrolysis. The pH value and free chlorine species distribution are investigated by aqueous chemistry of chlorine species coupled with ionic diffusion and electric migration. The model is verified by confirming the evolution of hydrogen and oxygen from the experimental seawater electrolysis cell.