

Boyu Wang & Yichen Liu & Stephan Liu  
*Self-Sustained Desalination in Combination with Wastewater Treatment*

Current desalination technologies are energy intensive and may hinder their practical applications. In this study, we evaluated the microbial desalination cell (MDC) as a new self-sustained desalination system. The principle of MDC is to use electricity-generating bacteria to consume organic matter in wastewater and create an electrical field that separates salts in saline water. Most MDC studies use easily biodegradable substrates such as glucose and sodium acetate. There have been limited studies using wastewater as a substrate for real-world applications, especially for triple purposes of generating electricity, desalination, and wastewater reclamation as designed in our studies. Our experiments were conducted with three-cell MDCs and two-cell microbial fuel cells (MFC) as batch operation systems. Glucose and diluted wastewater were used as substrates. The anion and cation exchange membranes were used to separate the anode, desalination, and cathode chambers. Evaluation of experimental results demonstrates that: MDC is a promising technology for self-sustained wastewater treatment and desalination; Desalination efficiency was positively correlated with the energy output of MDC; The removal rate of organic matter from wastewater was affected by the overall system conductance and chloride concentration in anode chamber; Less electricity was generated with wastewater compared to glucose, which may be caused by the lower biodegradability of the former. Future experiments should focus on improving electricity generation by evaluating the impact of: Other bacteria in wastewater on electricity generation; The size and biodegradability of organic matter in wastewater ; The concentration of organic matter in wastewater.