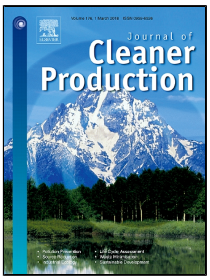
Accepted Manuscript



A Review of Microbial Desalination Cell Technology: Configurations, Optimization and Applications

Abdulah Al-Mamun, Waqar Ahmad, Mahad Said Baawain, Mohammad Khadem, Bipro Ranjan Dhar

PII:	S0959-6526(18)30360-3
DOI:	10.1016/j.jclepro.2018.02.054
Reference:	JCLP 12001
To appear in:	*Journal of Cleaner Production*
Received Date:	28 September 2017
Revised Date:	04 February 2018
Accepted Date:	05 February 2018

Please cite this article as: Abdulah Al-Mamun, Waqar Ahmad, Mahad Said Baawain, Mohammad Khadem, Bipro Ranjan Dhar, A Review of Microbial Desalination Cell Technology: Configurations, Optimization and Applications, *Journal of Cleaner Production* (2018), doi: 10.1016/j.jclepro.2018.02.054

A Review of Microbial Desalination Cell Technology: Configurations, Optimization and Applications

Abdulah Al-Mamun[a†], Waqar Ahmad[a], Mahad Said Baawain[a], Mohammad Khadem[b], Bipro Ranjan Dhar[d]

[a]Department of Civil and Architectural Engineering, College of Engineering, Sultan Qaboos University, P.O. Box 33, Al-Khoud 123, Muscat, Sultanate of Oman.

[b]Department of Mechanical and Industrial Engineering, College of Engineering, Sultan Qaboos University, P.O. Box 33, Al-Khoud 123, Muscat, Sultanate of Oman.

[c]Civil and Environmental Engineering, School of Mining and Petroleum Engineering, University of Alberta, 9211-116 Street NW, Edmonton, Alberta, Canada T6G 1H9.

[†]Corresponding author. Tel. : +968 24142598 ; Fax : +968 24141331.

E-mail address : aalmamun@squ.edu.om (A. Al-Mamun)

Abstract

Seawater could be a potential source of freshwater to manage the intensified demand of drinking water for new generations. The recent techniques for desalination and wastewater treatment are energy intensive and unsustainable. Therefore, an integrated and sustainable approach is essential to achieve cost-effective desalination through wastewater treatment. Microbial desalination cell (MDC) has been proven to be one of the emerging technologies capable of simultaneous wastewater treatment, seawater desalination and eco-energy production. This technique generates electricity through the bio-electrochemical oxidation of organics present in wastewater. The produced electricity is utilized to drive the migration of ions in MDC system. This ionic migration will result in desalination as well as formation of value-added by-products. The review summarizes the recently investigated MDC configurations along with their critical evolution of designs and operational parameters on the desalination and power generation capabilities. The review also acknowledges the emerging applications of MDC for microbial electrochemical desalination, bio-remediation, nutrients recovery, water softening, and value-added chemical production. The key findings included that the MDC system achieved a remarkable desalination without any external power input, and treatment of wastewater, and recovery of power without intermediate steps. The technical challenges associated with their practical applications were maintaining the pH in cathodic and anodic fluids, higher internal resistance, usage of catalysts on electrodes, and membrane fouling and durability. However, for certain configurations especially for microbial electrolysis and desalination cell (MEDC)/microbial electrolysis desalination and chemical production cell (MEDCC), the integration with electrodialysis module can significantly increase their performances. The installation of ED module will establish the pH neutrality and increased water recovery through recirculation of electrolytes between chambers of ED module and these MDC configurations. However, the sustainable development of MDC technology and its scale-up requires future investigations related to prevention of membrane fouling, materials feasibility, electron transfer kinetics, microbial growth and durability of catalyst. The feasibility studies are also