

EVALUATION OF 9-CHAMBER QUADRIPARTITE MICROBIAL DESALINATION CELL FOR HIGH-STRENGTH WASTEWATER TREATMENT, BIOELECTRICITY GENERATION AND SALT REMOVAL

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Abstract

Microbial desalination cells (MDCs) are the most attractive and eco-friendly technology for simultaneous wastewater treatment, bioelectricity generation and salt removal. Most MDCs in the previously reported works were consisted of 3 chambers, fed with synthetic or actual municipal wastewater. In this work a 9 chamber quadripartite MDC (QMDC) fed with septic tank sludge (septage) was examined for the first time. Desalination rate, organic pollution removal, Columbic efficiency and energy production were investigated over short and long-term operation. The roughened surface graphite (RSG) was used as both anode and cathode electrodes in the fabricated MDCs. The obtained results showed that QMDC can produce a power density of up to 8 W m^{-3} , maximum COD removal of 91.1% and desalination efficiency of 72.8%. In addition, long-term operation of QMDC under repeated batch cycles caused a significant drop in MDC performance, in terms of both electricity generation and salt removal. Through SEM images, a multilayer of biofilm was observed on membranes surface which had an inhibitory effect on MDC performance.

Keywords: Septic tanks sludge, Bioelectricity, COD removal, 9 chambers quadripartite microbial desalination cell