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微生物电容脱盐燃料电池性能研究

Investigation on the performance of microbial capacity desalination cell

关键词: [微生物电容脱盐燃料电池](#) [反应时间](#) [盐溶液浓度](#) [电极对数](#) [电容再生](#)

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摘要: 以微生物电容脱盐燃料电池(MCDC)为研究对象,考察了反应时间、盐溶液浓度和电容电极对数对MCDC脱盐效率的影响.试验采用阳离子交换膜分隔阳极室与脱盐室,阴离子交换膜分隔阴极室与脱盐室.试验结果显示在处理 $5\text{ g}\cdot\text{L}^{-1}$ 的NaCl溶液试验中,脱盐室溶液盐度先降低后升高,在反应运行30 min时,脱盐室达到最大脱盐率47.83%.同时发现在脱盐过程中,阳极室和阴极室溶液盐度持续降低,运行150 min后分别下降到15.24%和6.12%.随盐溶液浓度的增加,脱盐率降低,单位电极吸附量增加,根据Langmuir方程和Freundlich方程的线性拟合得到,MCDC最大脱盐吸附容量为 $72.99\text{ mg}\cdot\text{g}^{-1}$,电容吸附为复杂度的双分子层吸附.电极对数从1对增加到4对,MCDC的脱盐效率提高了37.37%.通过电容电极反接,可在1 h内实现电容再生.

Abstract: The effects of desalination time, concentration of salt water and the number of capacity electrode on the performance of salt removal were investigated in a microbial capacity desalination cell (MCDC). The MCDC was constructed by inserting a cation exchange membrane (CEM) next to the anode and an anion exchange membrane (AEM) next to the cathode. Results showed that the conductivity of salt water decreased at the beginning of time and then increased slowly, when treating $5\text{ g}\cdot\text{L}^{-1}$ of NaCl solution. When the reactor operated for 30 min with $5\text{ g}\cdot\text{L}^{-1}$ NaCl solution, the salt removal efficiency reached the highest of 47.83%. The conductivity reductions of anolyte and catholyte in MCDC were 15.24% and 6.12% respectively after desalinated for 150 min. With the increase of NaCl concentration, the salt removal efficiency decreased and the adsorption quantity of total dissolved solid per gram activated carbon cloth increased. According to the equation liner fittings of the Langmuir and Freundlich, the maximum adsorption capacity of MCDC was $72.99\text{ mg}\cdot\text{g}^{-1}$ and the capacity adsorption was complex bilayer adsorption. The salt removal efficiency increased by 37.37%, when the electrode number increased from 1 to 4 pairs. The capacity can be regenerated within 1 h through exchange the connection of electrode and activated carbon cloth assemblies.

Key words: [microbial capacity desalination cell](#) [operation time](#) [NaCl concentration](#) [electrode number](#) [capacity regeneration](#)

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