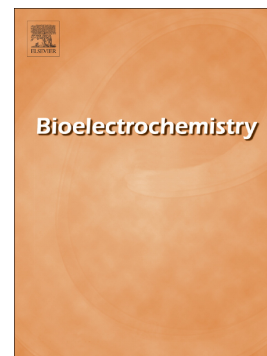


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Comparative performances of microbial capacitive deionization cell and microbial fuel cell fed with produced water from the Bakken shale

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Abstract

This study evaluates and compares the performance of microbial fuel cells (MFCs) and microbial capacitive deionization cells (MCDCs) fed with wastewater produced from the Bakken shale. The produced water was characterized by high levels of dissolved solids and chemical oxygen demand (COD). Two-compartment MFCs and three-compartment MCDCs were evaluated under batch-fed mode using mixed microbial consortia in the anode, ferricyanide in the cathode, and produced water as the electrolyte in the anode and capacitive deionization units. COD removal in the MFCs was 88%, while that in the MCDCs was limited to 76%. The lower performance of the MCDCs was due to the large impedance ($6600 \Omega \text{ cm}^2$) compared with the MFCs ($870 \Omega \text{ cm}^2$). However, the MCDCs achieved two-fold higher removal of dissolved solids. Both the MFCs and MCDCs suffered from a higher impedance induced by fouling in the latter stages of the operation.

Keywords: Bakken shale; desalination; produced water; microbial fuel cells; electrochemical impedance

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