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Stacking of Microbial Fuel Cells with Continuous Mode Operation for Higher Bioelectrogenic Activity

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Abstract

The effect of microbial fuel cell (CMFC) stacking with continuous mode operation was evaluated on the stable power output. Three single chambered air cathode CMFCs with Nafion ($CMFC_N$), Terry cotton ($CMFC_T$) and without membrane ($CMFC_{ML}$) were operated in continuous mode initially. Maximum power density (PD) and COD removal efficiency was obtained for $CMFC_N$ (0.1 W/m^2, 50%) followed by $CMFC_{ML}$ (0.062 W/m^2, 47%) and $CMFC_T$ (0.025 W/m^2, 39%) which were stable throughout the operation. To increase the power output further, stacking of CMFCs was carried in series/parallel circuitry, which yielded high power density in parallel (2.0 W/m^2; 7.2 W/m^3) and high voltage in series (1.1 V). Study also evidenced that stacking resulted in high and stable bioelectricity by minimizing the electron losses in comparison to individual CMFCs operation. Constant replenishment of substrate favored stable and high power output signifying the impact of continuous mode operation.

Keywords*:* Bioelectricity; Wastewater treatment; Electron losses; Redox currents; Power density.