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Simultaneously energy production and dairy wastewater treatment using bioelectrochemical cells: In different environmental and hydrodynamic modes

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Abstract:

A successful design, previously adapted for treatment of complex wastewaters in a microbial fuel cell (MFC), was used to fabricate two MFCs, with a few changes for cost reduction and ease of construction. Performance and electrochemical characteristics of MFCs were evaluated in different environmental conditions (in complete darkness and presence of light), and different flow patterns of batch and continuous in four hydraulic retention times from 8 to 30 h. Changes in chemical oxygen demand, and nitrate and phosphate concentrations were evaluated. In contrast to the microbial fuel cell operated in darkness (D-MFC) with a stable open circuit voltage of 700 mV, presence of light led to growth of other species, and consecutively low and unsteady open circuit voltage. Although performance of the MFC subjected to light (L-MFC) was quite low and unsteady in dynamic state (internal resistance=100 Ω, power density=5.15 $W \cdot m^{-3}$), it reached power density of 9.2 $W \cdot m^{-3}$ which was close to performance of D-MFC (internal resistance=50 Ω, power density=10.3 $W \cdot m^{-3}$). Evaluated only for D-MFC, the coulombic efficiency observed in batch mode (30%) was quite higher than the maximum acquired in continuous mode (9.6%) even at the highest hydraulic retention time. In this study, changes in phosphate and different types of nitrogen existing in dairy wastewater

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