Electricity production from xylose using a mediator-less microbial fuel cell

Electricity generation integrated with xylose degradation was investigated in a two-chamber mediator-less microbial fuel cell (MFC). Voltage output followed saturation kinetics as a function of xylose concentration for concentration below 9.7 mM, with a predicted maximum of 86 mV (6.3 mW m(-2) or 116 mW m(-3)) and half-saturation constant (K(s)) of 0.29 mM. Xylose concentrations from 0.5 mM to 1.5 mM resulted in coulombic efficiencies and maximum voltage ranging from 41+/−1.6% to 36+/−1.2% and 55+/−2.0 mV to 70+/−3.0 mV respectively. Xylose degradation rate increased with increasing xylose concentration up to 9.7 mM and the predicted maximum degradation rate was 0.13 mM h(-1) and K(s) of 3.0 mM. Stirring by nitrogen in the anode chamber led to 99+/−2.3 mV maximum voltage (8.4+/−0.4 mW m(-2) or 153+/−7.1 mW m(-3)) and 5.9+/−0.3% coulombic efficiency at MFC running time 180 h, which were respectively 17+/−1.2% and 37+/−1.8%, higher than those without stirring. The COD removal under stirring was 22.1+/−0.3%, which was slightly lower than that of 23.7+/−0.4% under no stirring. However, stirring resulted in 59% lower xylose degradation rate. This work demonstrates that xylose can be used in the MFC for electricity production. Comparatively higher electricity generation and coulombic efficiency can be obtained by adjusting initial xylose concentration and applying stirring in the anode chamber.

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