Continuous electricity generation with piggery wastewater treatment using an anaerobic baffled stacking microbial fuel cell

Zhengfang Ye, Baogang Zhang, Ye Liu, Zhongyou Wang, Caixing Tian

Abstract

Anaerobic baffled stacking microbial fuel cells (ABSMFCs) consisting of four individual MFCs with total volume of 6.4 L was constructed to generate electricity from piggery wastewater in present study. Anode materials (carbon paper, carbon fiber felt, and graphite granule) and anode connecting modes of the four MFCs (in series or parallel) could affect the bioelectricity generation and wastewater treatment effects. When they were connected in series, voltage loss occurred and voltage reversed with increase in current between some MFCs. The influent COD loadings showed significant relationship to the performance of ABSMFC, as it increased from 0.2 to 4.0 g/L.d, voltage output across an external resistance of 1,000 Ω decreased by 71.7% (in series) and 30.7% (in parallel), respectively; coulombic efficiency decreased rapidly by 96.7% (in series) and 94.3% (in parallel), while COD removal efficiency initially increased and then decreased. This study demonstrated that the large volume ABSMFC can realize stable power output associated with piggery wastewater treatment and is suitable to scale-up for actual application.

Keywords: Anaerobic baffled stacking microbial fuel cells (ABSMFCs); Anode materials; COD removal; Piggery wastewater

*Corresponding authors.