

Pre-Treatment of Anodic Inoculum with Nitroethane to Improve Performance of a Microbial Fuel Cell

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Abstract : Methanogenic substrate loss is reported to be a major bottleneck in microbial fuel cell which significantly reduces the power production capacity and coulombic efficiency (CE) of microbial fuel cell (MFC). Nitroethane is found to be a potent inhibitor of hydrogenotrophic methanogens in rumen fermentation process. Influence of nitroethane pre-treated sewage sludge inoculum on suppressing the methanogenic activity and enhancing the electrogenesis in MFC was evaluated. MFC inoculated with nitroethane pre-treated anodic inoculum demonstrated a maximum operating voltage of 541 mV, with coulombic efficiency and sustainable volumetric power density of 39.85 % and 14.63 W/m³ respectively. Linear sweep voltammetry indicated a higher electron discharge on the anode surface due to enhancement of electrogenic activity while suppressing methanogenic activity. A 63 % reduction in specific methanogenic activity was observed in anaerobic sludge pre-treated with nitroethane; emphasizing significance of this pretreatment for suppressing methanogenesis and its utility for enhancing electricity generation in MFC.

Keywords : coulombic efficiency, methanogenesis inhibition, microbial fuel cell, nitroethane

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