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论文

生物阴极微生物燃料电池不同阴极材料产电特性

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摘要:

以葡萄糖(COD初始浓度为2000 mg/L, COD为化学需氧量)为阳极燃料底物, 考察了碳纤维刷和柱状活性碳颗粒作为生物阴极微生物燃料电池(MFC)阴极材料的产电性能. 研究结果表明, 碳纤维刷MFC的启动时间比碳颗粒MFC的长, 达到稳定状态后的恒负载(300 Ω)电压(0.324 V)比碳颗粒阴极MFC的(0.581 V)低. 极化分析结果表明, 碳纤维刷MFC和碳颗粒MFC的最大功率密度分别为24.7 W/m3(117.2 A/m3)和50.3 W/m3(167.2 A/m3). 电化学交流阻抗谱(EIS)测定结果表明, 由于电极材料对微生物生长和分布状态存在不同的影响, 使得碳纤维刷阴极MFC的极化内阻大于碳颗粒阴极MFC的极化内阻.

关键词: 微生物燃料电池; 生物阴极; 电极材料; 功率密度

Power Generation in Bio-cathode Microbial Fuel Cell with Different Cathode Materials

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Abstract:

Power generation from bio-cathode microbial fuel cell(MFC) with graphite fiber brush(GFB) and graphite granule(GG) as cathode material was investigated with COD(Chemical Oxygen Demand) of 2000 mg/L glucose as anodic fuel. The results demonstrated that GFB-cathode MFC could be started up after a longer time with lower voltage of 0.324 V than GG-cathode MFC(0.581 V) at constant load of 300 Ω. Polarization analysis showed that the maximum power density of 24.7 W/m3(117.2 A/m3) and 50.3 W/m3(167.2 A/m3) were reached for GFB-cathode MFC and GG-cathode MFC, respectively. As indicated by electrochemical impedance spectroscopy(EIS) analysis, the difference in power output of two MFCs should result from internal resistance, particularly activation resistance. This is mainly because of the difference in surface feature of two materials for microbial growth and distribution. Organic compounds could be removed in both MFC systems, which accomplished waste water treatment.

Keywords: Microbial fuel cell; Bio-cathode; Electrode material; Power density

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