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厌氧流化床净化畜禽废水与产电性能

Research on livestock wastewater treatment and producing electricity using anaerobic fluidized bed

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英文关键词: [wastewater](#) [ammonia](#) [voltage control](#) [AFB-MFC](#) [COD volume loading](#) [COD removal efficiency](#)

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中文摘要:

为实现从畜禽废水处理中回收能源,先后以厌氧沼液、低浓度畜禽原水及高浓度畜禽原水作为进水,利用厌氧流化床双室微生物燃料电池(anaerobic fluidized bed microbial fuel cell, AFB-MFC)进行微生物产电及有机物去除研究,重点考察氨态氮质量浓度及COD(化学需氧量)容积负荷对系统COD去除率及产电性能的影响。结果表明:以稀释后的沼液作为进水时,当氨态氮质量浓度达到387.6mg/L时,氨态氮对产电微生物产生明显的短期抑制,产电量下降7.0%,但经过5?d的适应期后,系统产电恢复到原来的水平。以畜禽原水作为进水时,系统COD容积负荷在12?d内由2.3?kg/(m<sup>3</sup>·d)提升至14.9?kg/(m<sup>3</sup>·d)时,COD去除率保持在74.5%~88.1%;随着容积负荷的提升,系统产电量上升,但上升幅度较小,最高输出电压为379.3?mV,相应的面积功率密度为74.9?mW/m<sup>2</sup>;由于进水pH值的差异,高浓度畜禽原水最高输出电压较低浓度畜禽原水低21.4?mV;AFB-MFC系统内阻较低,仅为48.5?Ω,此时功率密度为75.6?mW/m<sup>2</sup>。本装置实现了畜禽废水的高效处理,同时获得电能,为其资源化处理提供新途径。

英文摘要:

In order to recycle source of energy from livestock wastewater, using a two-chambered anaerobic fluidized bed microbial fuel cell (AFB-MFC) and taking digested piggery wastewater, low-concentration piggery wastewater and high-concentration piggery wastewater as substance successively, performances of COD(Chemical Oxygen Demand) removal efficiency and electricity production was evaluated at different COD volume loading and feeding ammonia concentration. Using the digested wastewater as the substance, the ammonia caused 7.0% inhibition of electricity production as the ammonia concentration was up to 387.6mg/L, but the power generation recovered five days later. Using the raw wastewater as the substance, the COD volume loading increased from 2.3 kg · m<sup>-3</sup> · d<sup>-1</sup> to 14.9 kg · m<sup>-3</sup> · d<sup>-1</sup> within 12 days, and the COD removal efficiencies remained between 74.5% and 88.1%. The output voltage increased slightly with the increasing of COD volume loading, the maximum output voltage and the power density were 379.3mV · m<sup>-2</sup> respectively. Because of the difference of the substance pH, the maximum output voltage of the low-concentration piggery wastewater was 21.4 mV higher than the high-concentration piggery wastewater. The AFB-MFC's internal resistance was 48.5 Ω, and the maximum power density was 75.6mW · m<sup>-2</sup>. This study demonstrates that AFB-MFC can treat the livestock wastewater effectively and produce electricity, providing a novel approach for the safe disposal and recycle of livestock wastewater.

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